

ORDER NO. KM40009696C2

Service Manual

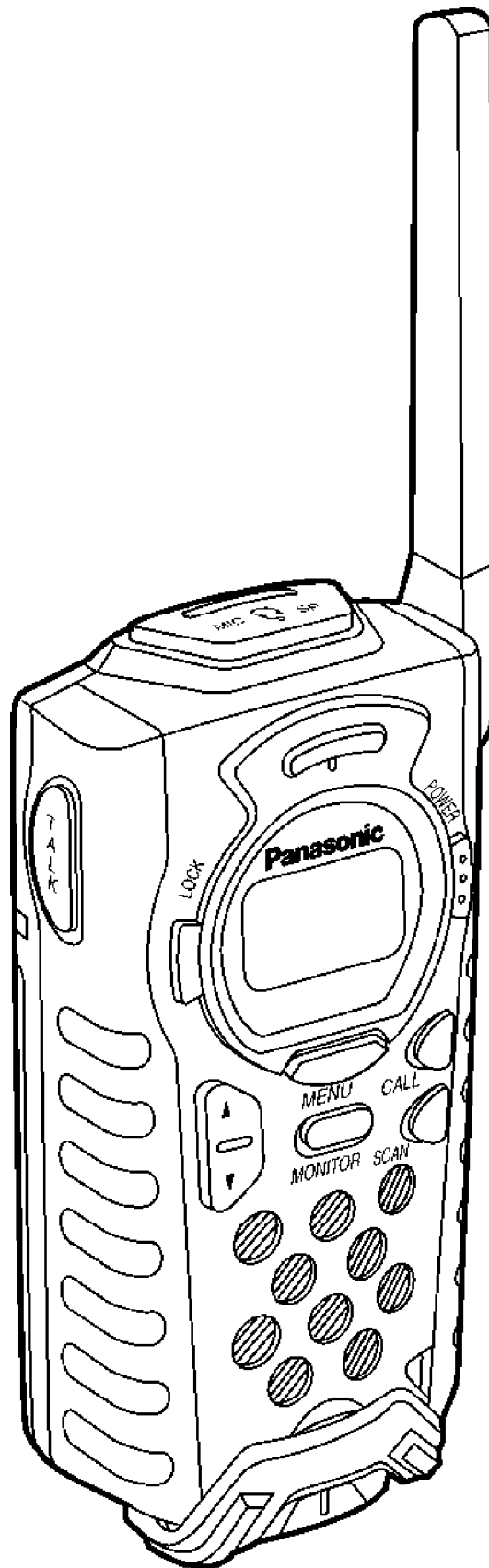
2-Way Radio

KX-TR320EXF / KX-TR320EXS

Blue Version

Silver Version

(for Europe)



SPECIFICATIONS

SPECIFICATION

Power Requirements:	4.5 V DC, 3 AA (LR6) size alkaline batteries (not included)
Operating Frequency:	446.00625~446.09375 MHz 8 channels, 38 codes
External Power Source:	DC IN 4.5V jack accepts: 12 V negative ground car battery with Car DC Power Adaptor (optional)
Alkaline Battery Life:	Approx. 30 hours (Based on a usage duty of 90% standby, 5% talk, 5% receive)
Dimension Weight (H x W x D):	4 ⁹ / ₃₂ " x 2 ¹⁵ / ₃₂ " x 1 ¹ / ₄ " (109 x 63 x 32 mm) 0.42 lbs. (192 g) with belt clip and batteries

Design and specifications are subject to change without notice.

 **2000 Kyushu Matsushita Electric Co., Ltd. All rights reserved.**
Unauthorized copying and distribution is a violation of law.

WARNING

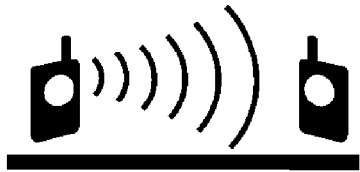

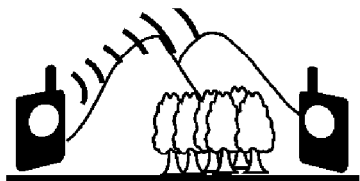
This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

When you mention the serial number, write down all 11 digits. The serial number may be found on the label affixed to the bottom of the unit.

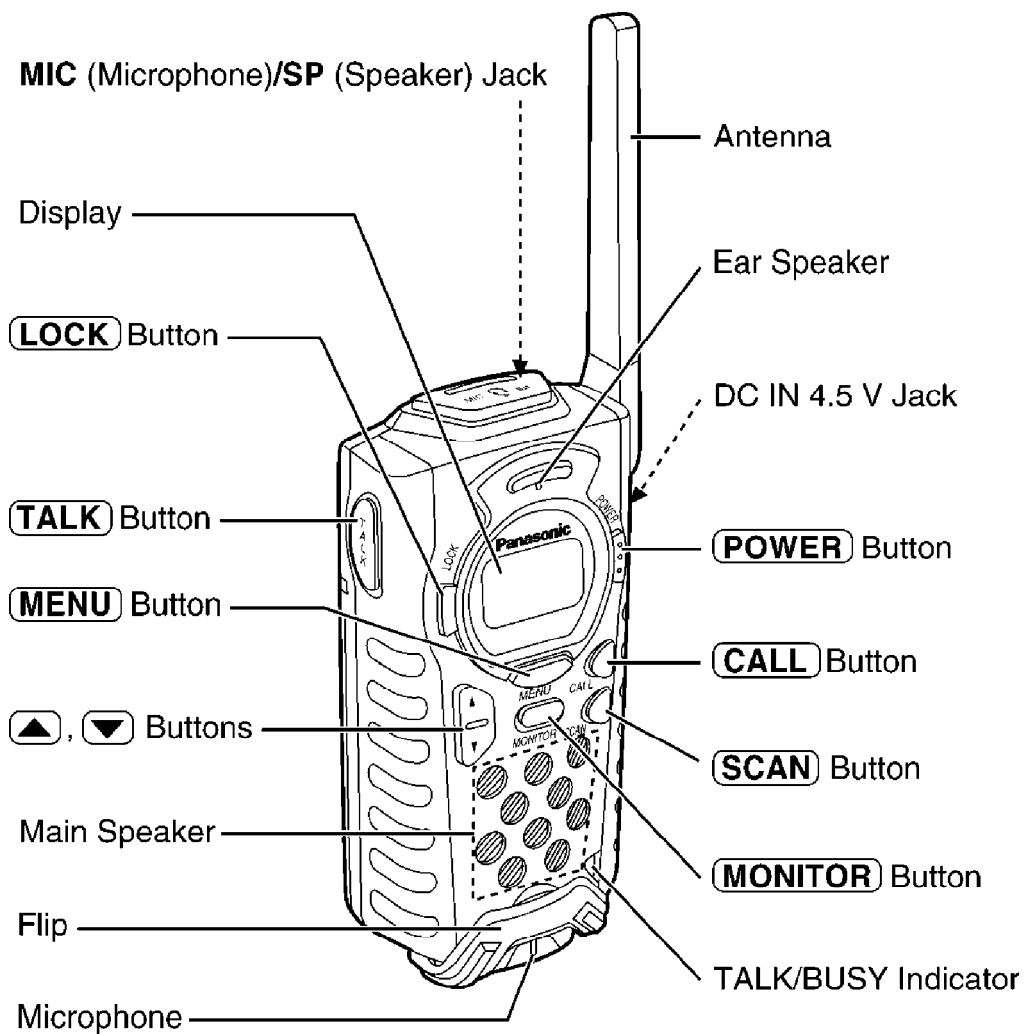
Panasonic

1. TALK RANGE

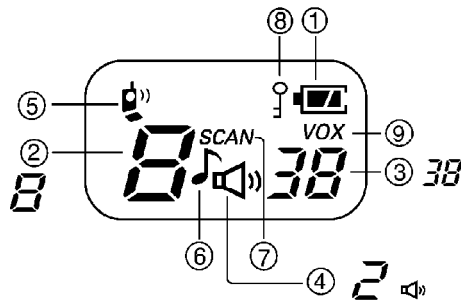
The unit is designed to maximize performance and improve transmission range in the field. However, the talk range depends on your surrounding environment. It is necessary for the unit to have a clean "line-of-sight" to show the ideal range performance. The talk range will be affected by concrete structures, heavy foliage and transmission from inside a building or vehicle.

Optimal Range	Range in flat, open areas is up to 5 km.	
Medium Range	Range is decreased when buildings and trees are in the way.	
Minimal Range	Dense foliage and mountains can limit range.	

2. LOCATION OF CONTROLS



3. DISPLAY

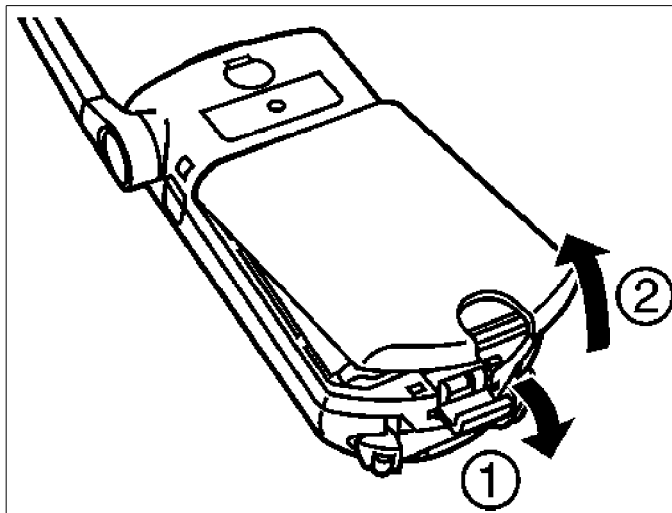


- ① The display shows the battery strength.
- ② The unit is using the operating channel number 8.
- ③ The unit is using the group code number 38.
- ④ The volume is set to level 2.
- ⑤ The flip is open.
- ⑥ The unit is sending call tones.
- ⑦ The unit is using the channel scan function.
- ⑧ The key lock function is ON.
- ⑨ The unit is in the VOX mode.

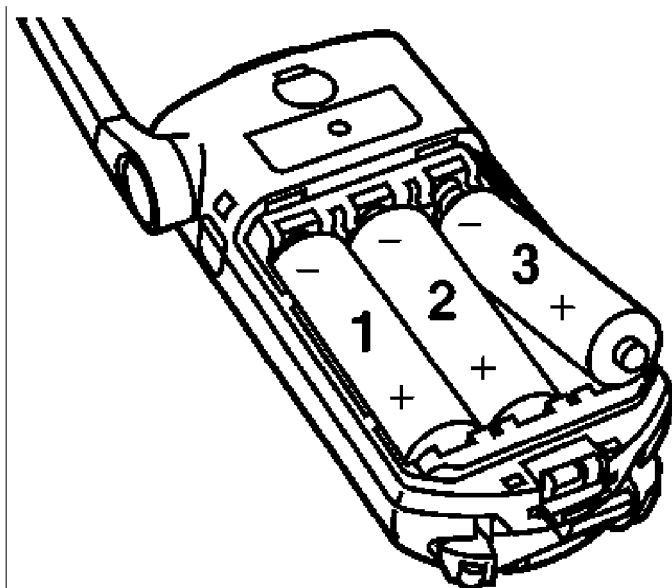
4. BATTERY INSTALLATION

The unit requires 3 AA (LR6) size alkaline batteries (not included). / The battery life is about 30 hours. (Based on a usage duty of 5% receive, 5% talk, 90% standby.)

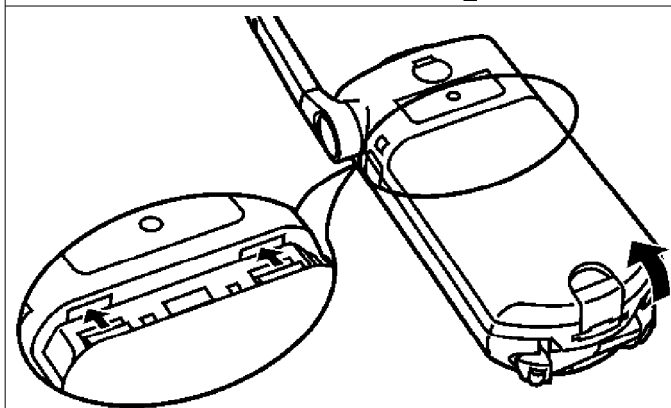
- Make sure that the unit is powered OFF before replacing the batteries.



- 1 Pull down the hook and remove the cover



2 Install (or replace) the batteries using the correct polarity (+, -).



3 Close the cover.

Battery precautions:

The batteries should be used correctly, otherwise the unit may be damaged by battery leakage.

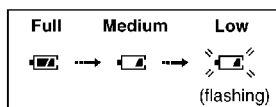
- Do not mix different types of batteries.
- Do not charge, short-circuit, disassemble or heat batteries, and do not dispose of batteries in fire.
- Remove all the batteries when replacing.

Battery strength:

You can check the battery strength on the display (see below) while the unit is in use. If the unit beeps intermittently and "▲" flashes on the display, replace all the batteries with new ones.

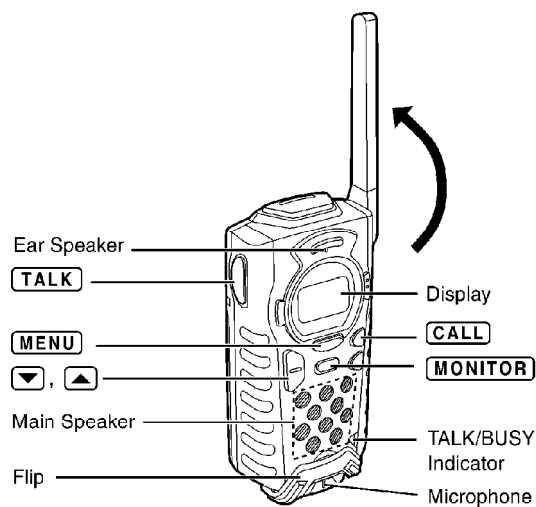
- If the unit is left on when the battery is LOW, everything, except the flashing "▲" will disappear from the display. Only **POWER** can be operated to turn the unit off.
- Battery life may vary depending on usage conditions and ambient

temperature.



5. OPERATION

The unit has 8 operating frequency channels and 38 group codes. To talk to others, all users in your group must be using the same channel and group code.



5.1. Selecting the Operating Channel

The factory preset is "1".

- 1 Press **MENU**.
 - The current channel will flash on the display.
- 2 Press **▼** or **▲** repeatedly until the desired operating channel (1-8) is displayed.
- 3 When finished, press **TALK** or wait for 10 seconds.



- You can exit the programming mode any time by pressing **TALK** or waiting for 10 seconds.
- The selected channel will not be cleared even when you turn off the unit.

5.2. Selecting the Group Code (CTCSS)

The Continuous Tone Coded Squelch System (CTCSS) allows you to ignore (not hear) unwanted calls from other persons who are using the same channel. It provides communication with silent standby since you will only receive calls from group members using the same group code. The unit is equipped with 38 group codes. The factory preset is "1".

The CTCSS does not make your conversation private. It only allows you not to listen to unwanted conversations.

- 1 Press **[MENU]** twice.
 - The current group code will flash on the display.
 - 2 Press **[▼]** or **[▲]** repeatedly until the desired group code (1-38) is displayed.
 - 3 When finished, press **[TALK]** or wait for 10 seconds.
- You can exit the programming mode any time by pressing **[TALK]** or waiting for 10 seconds.
- The selected code will not be cleared even when you turn off the unit.



5.3. Backlit LCD Display

The lighted display will remain on for about 5 seconds after pressing any button except **[TALK]**, or closing the flip.

5.4. Monitor

The monitor function activates the speaker. Use this function when received signals are too weak to recognize. You can use the monitor function to check activity on the current channel before transmission.

- 1 Press and hold **[MONITOR]** to open the squelch.
 - The TALK/BUSY indicator lights green.
 - You will hear static if the channel is clear for use.
 - 2 Release **[MONITOR]** to close the squelch.
 - The TALK/BUSY indicator light goes out.
- If you want to use the monitor privately, open the flip before pressing **[MONITOR]**.

5.5. Monitor Sending/Receiving Message

- 1 Check the current channel activity.
 - Do not talk if someone is already on the channel.
 - 2 Press and hold **[TALK]** to transmit and talk into the microphone.
 - The TALK/BUSY indicator lights red.
 - 3 To receive, release **[TALK]**.
 - The TALK/BUSY indicator lights green.
 - Repeat steps 2 and 3 to continue communication.
- To maximize readability of your transmitted signal, pause a few seconds after pressing **[TALK]**, hold the unit 5 to 10 cm from your mouth and speak at a normal voice level.
- For safe motor vehicle operation, please do not use the unit while driving. Either stop vehicle or allow passenger to use instead.



To select the main speaker volume

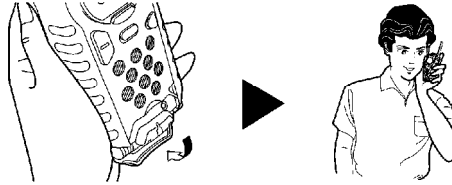
The factory preset is "5".

Press **[▼]** or **[▲]**.

- 1 • " " and the current volume level will flash on the display.
- 2 Press **[▼]** or **[▲]** repeatedly until the desired volume level (1-8) is displayed.

5.6. Private Talk

If you want to talk privately during transmission, open the flip. The unit enters the private talk mode. You can transmit by holding the unit near your ear like a telephone handset.



- 1 Open the flip and check the current channel activity.
 - "📞" is displayed.
 - **Do not talk if someone is already on the channel.**
 - 2 Press and hold **TALK** to transmit and talk into the microphone.
 - The TALK/BUSY indicator lights red.
 - 3 To receive, release **TALK**.
 - You can hear the other party's voice through the ear speaker.
 - The TALK/BUSY indicator lights green.
 - 4 When finished, close the flip.
 - "📞" will disappear.
- To maximize readability of your transmitted signal, pause a few seconds after pressing **TALK** and speak.

To select the ear speaker volume

The factory preset is "2".

- 1 Open the flip and press ▼ or ▲.
 - "🔊" and the current volume level will flash on the display.
- 2 Press ▼ or ▲ repeatedly until the desired volume level (1-3) is displayed.
- 3 When finished, close the flip.

5.7. Call Tones

The unit has five different call tones to identify each user and alert others that you intend to transmit. When you press **CALL**, the other party will be alerted with your call tones.

To send call tones

- 1 Press **CALL**.
 - The TALK/BUSY indicator lights red.
 - "🎵" is displayed and the call tones sound.
 - The other party will be alerted with the call tones.
- *The call tones will sound continuously if you press and hold **CALL**.*
- *If you want to send the call tones privately, open the flip before pressing **CALL**.*

To change the call tones

The factory preset is "1".

- 1 Press **MENU** four times.
 - "🎵" and the current setting will flash on the display.
- 2 Press ▼ or ▲ repeatedly until the desired setting (1-5) is displayed.
 - Each time you press the button, the selected call tones will sound.
- 3 When finished, press **TALK** or wait for 10 seconds.



5.8. Finding a Busy Channel

Channel scan allows you to monitor 8 channels and a selected group code. When the unit detects channel activity on your selected code, it stops scanning and locks in on the busy channel. You can listen and talk back (within 5 seconds of the end of a transmission) on the displayed channel without changing your settings.

- 1 Press **[SCAN]** .
 - "SCAN" will flash on the display.
 - Channel scan starts and monitors the channels from the current channel in the order below.

1→2→3- - - - -→8
- 2 The unit stops scanning when it finds a busy channel, and you will hear a message.
 - The TALK/BUSY indicator lights green.

If you want to scan other busy channels, press **[▲]** to scroll up or **[▼]** to scroll down.
- Channel scan starts again.
- If no message is received or there is no key operation for about 5 seconds, channel scan starts again.

To transmit during channel scan

- 1 Follow steps 1 and 2 of the channel scan procedure above.
 - 2 When the unit finds the desired busy channel and stops scanning, press **[TALK]** within 5 seconds (or during the message).
 - 3 To transmit, press and hold **[TALK]** and talk into the microphone.
To receive, release **[TALK]** .
 - After transmission, the unit will return to the standby mode showing the current channel and group code.
- If you want to scan privately, open the flip before pressing **[SCAN]**.
 - To communicate in channel scan mode, your unit must be set to the same group code as the other user(s) in your group. If your unit is set to a different code, the channel scan function will not detect channel activity in your group.

5.9. Key Lock

Key lock allows you to lock some buttons (**[POWER]** , **[MENU]** , **[▼]** , **[▲]** and **[SCAN]**) to prevent accidentally changing any radio settings.

- 1 Press and hold **[LOCK]** until " ? " is displayed.
- 2 To turn the key lock function OFF, press and hold **[LOCK]** until " ? " disappears.

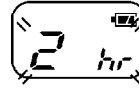
While the Key Lock function is ON, the following features can still be used.

- Sending/Receiving messages
- Sending/Receiving call tones
- Monitor
- Private talk

5.10. Auto Power OFF

The unit can be programmed to turn itself off after a certain period of no operation. This is useful to save the battery life. You can select the time period for the auto power off mode. The factory preset is "2" (2 hours).

- 1 Press **[MENU]** five times.
 - The current setting will flash on the display.
- 2 Press **[▼]** or **[▲]** repeatedly until the desired setting (0-3) is displayed.
 - 1: 1 hour 2: 2 hours 3: 3 hours
 - 0: OFF
- 3 When finished, press **[TALK]** or wait for 10 seconds.
 - you can exit the programming mode any time by pressing **[TALK]** or waiting for 10 seconds.
 - The auto power off function can be used whether the Key Lock function is active or not.



6. USING THE OPTIONS

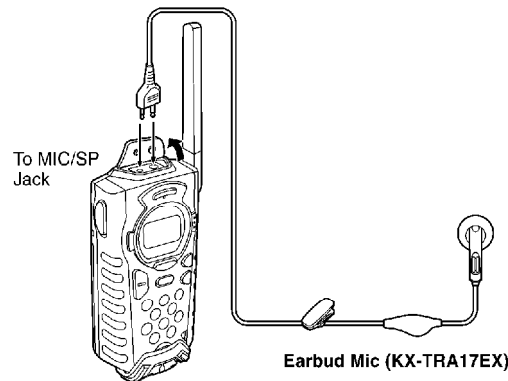
6.1. To Enjoy Hands-Free Operation

The unit has built-in Voice Activated Transmission (VOX) capability. Using an Earbud Mic (KX-TRA17EX) with the unit, you can activate the transmission with your voice.

The unit must be powered off before connection.

The unit enters the VOX mode when the unit is powered ON after the Earbud Mic is connected to the unit.

- "VOX" is displayed.
 - To switch to the PTT (Push-To-Talk) mode, press **[TALK]**.
 - To return to the VOX mode, turn the unit off, then on again.
- For details, see the Headset Mic or Earbud Mic operating instructions.



- There will be a brief delay between starting/stopping talking and radio transmission in the VOX mode.
- You cannot send a message while receiving in the VOX mode. Wait until the other party stops talking.
- To select the VOX sensitivity.
- When you finished using the Earbud Mic, unplug the Earbud Mic from the MIC/SP jack to save the battery life.

To select the receiver volume

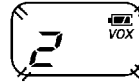
The factory preset is "2".

- 1 Press **[▼]** or **[▲]**.
 - "V" and the current volume level will flash on the display.
- 2 Press **[▼]** or **[▲]** repeatedly until the desired volume level (1-3) is displayed.

To select VOX sensitivity

You can select the VOX sensitivity of the radio to compensate for varying levels of noise around you. The factory preset is "2" (Medium).

- 1 Press **MENU** three times.
 - " **VOX** " and the current setting will flash on the display.
 - 2 Press **▼** or **▲** repeatedly until the desired setting (1-3) is displayed.
 - 1: Low (for high levels of noise)
 - 2: Medium (for use in most applications)
 - 3: High (for low levels of noise)
 - 3 When finished, press **TALK** or wait for 10 seconds.
- You can exit the programming mode any time by pressing **TALK** or waiting for 10 seconds.

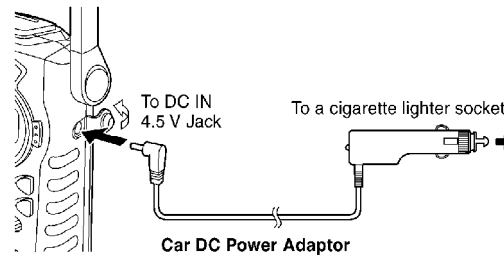


6.2. For Use with a Car Battery

If you connect the unit to the cigarette lighter socket of your car using a Car DC Power Adaptor (KX-TRA20EX), you can enjoy transmitting without thinking about the battery life.

The unit must be powered off before connection.

For details, see the operating instructions for the Car DC Power Adaptor.



- The unit will not run on batteries as long as the DC IN 4.5 V jack is plugged in.
 - Use only Panasonic Car DC Power Adaptor (KX-TRA20EX). Using any other car DC power adaptor may cause damage to the unit.
- The Car DC Power Adaptor cannot be used to charge rechargeable battery.**

7. DISASSEMBLY INSTRUCTIONS

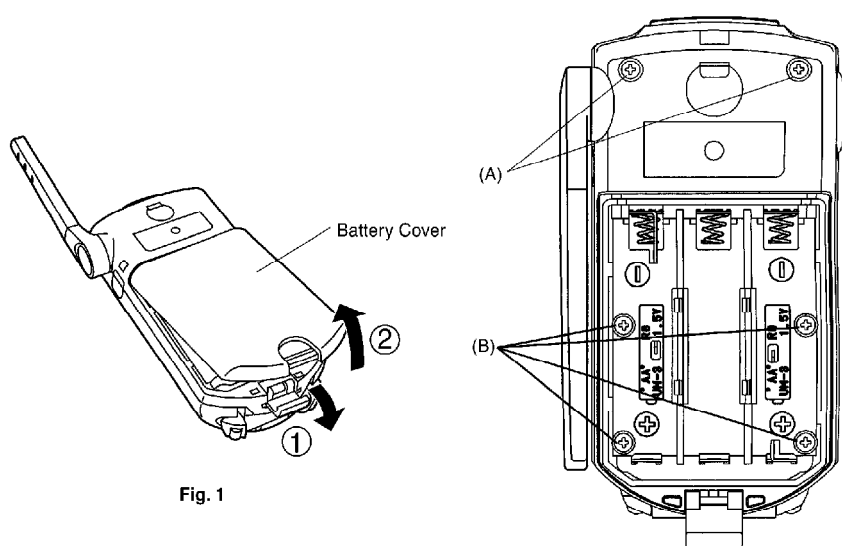


Fig. 1

Fig. 2

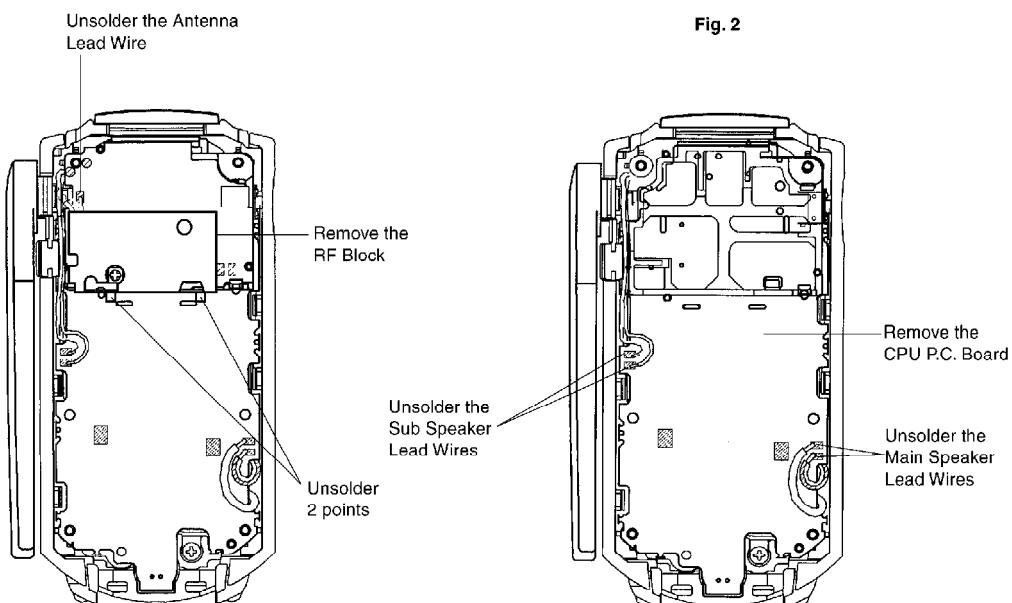
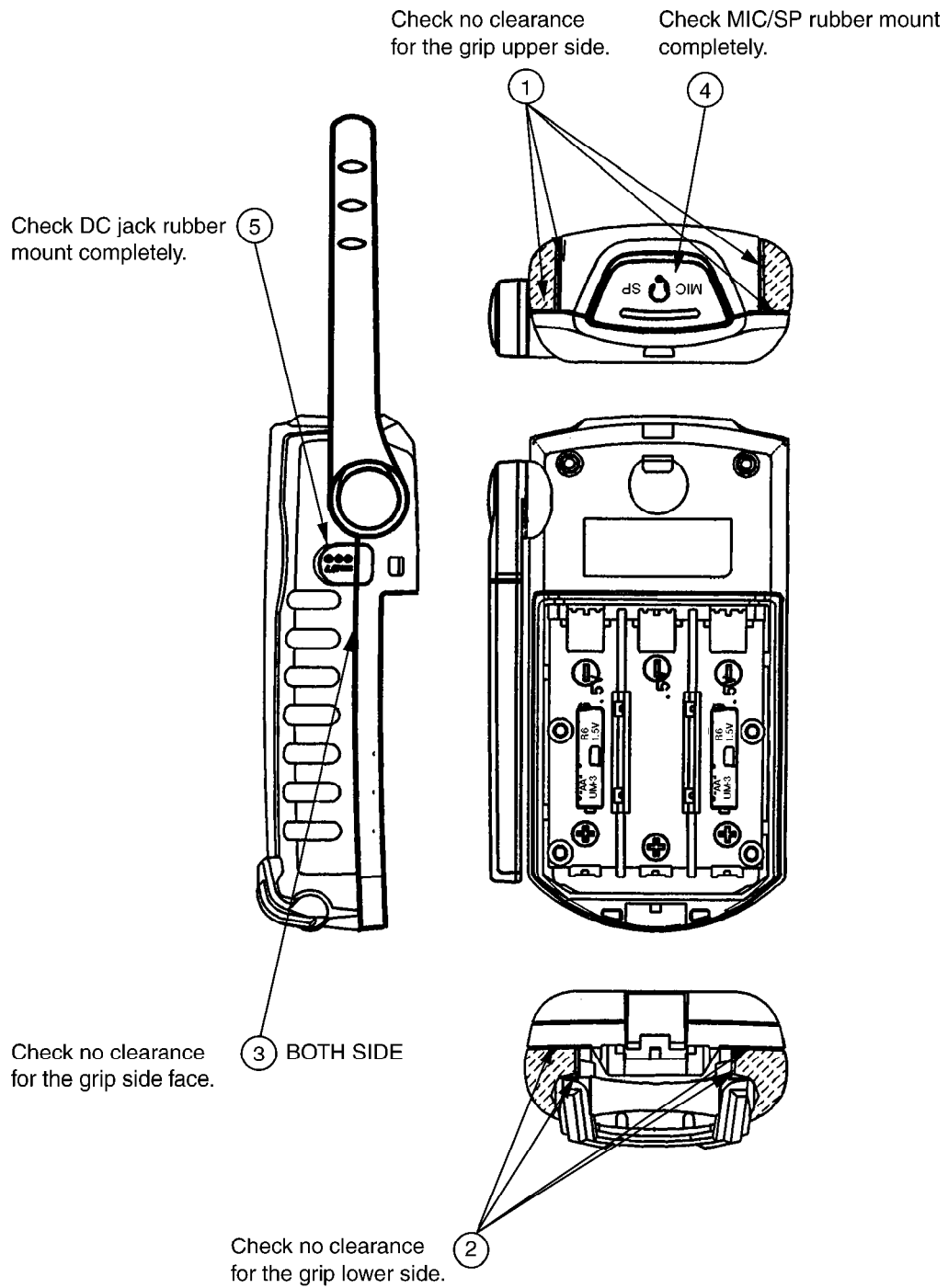


Fig. 3

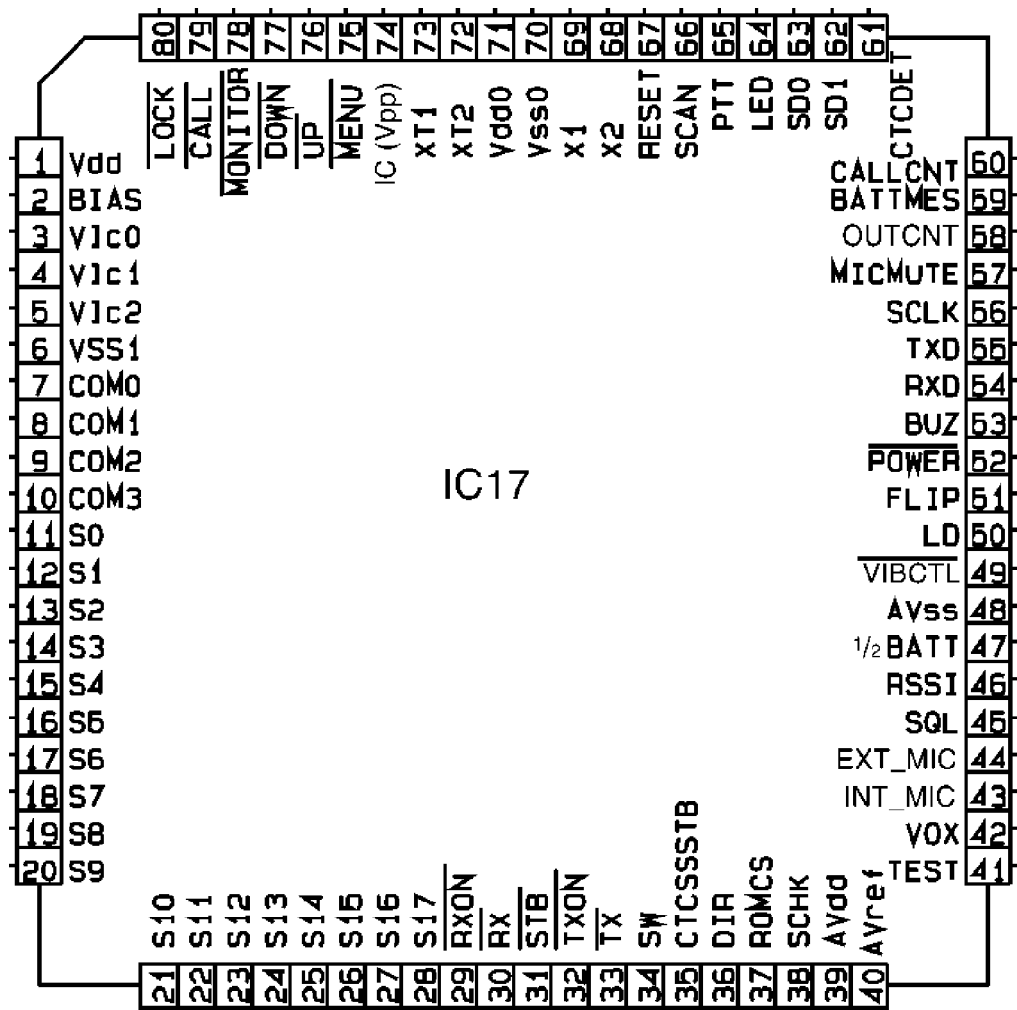
Fig. 4

Fig.	To remove	Remove —.
1	Battery Cover	Remove the Battery Cover.
2	Rear Cabinet	Screws (2X10) (A)X2
		Screws (2X7) (B)X4
3	RF Block	Unsolder the Antenna Lead Wire and shield case.
		Remove the RF Block.
4	CPU P.C. Board	Unsolder the Main and Sub Speaker Lead Wires.
		Remove the CPU P.C. Board.

8. HOW TO CHECK SPLASH RESISTANCE

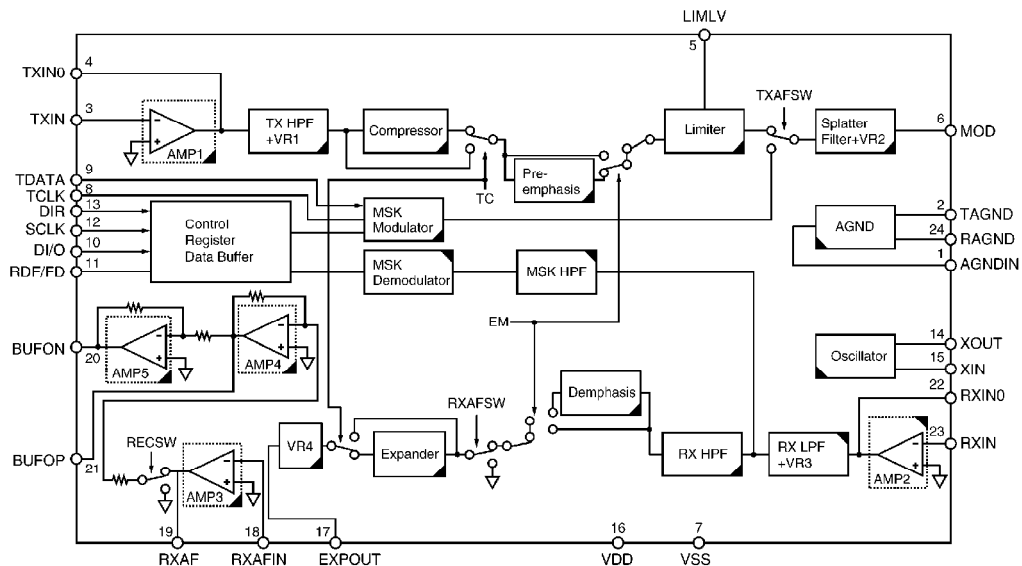


9. CPU DATA

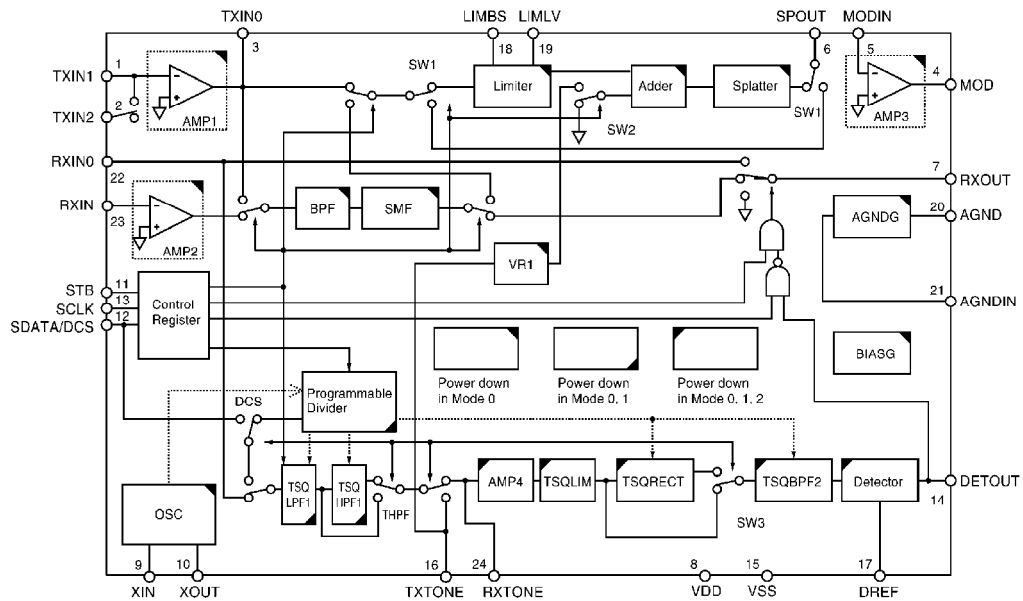


Pin	Description	I/O	Low	Hi-Z	High	Pin	Description	I/O	Low	Hi-Z	High
1	Vdd	-	-	-	Fixed	41	TEST	I	Test Mode	-	-
2	BIAS	-	-	-	Fixed	42	VOX	I	Active	-	Active
3	Vlc0	-	-	-	Fixed	43	INT_MIC	I	Active	-	Active
4	Vlc1	-	-	-	Fixed	44	EXT_MIC	I	Active	-	Active
5	Vlc2	-	-	-	Fixed	45	SOL	I	Receive	-	stanby
6	Vss1	-	Fixed	-	-	46	RSSI	I	Weak Electric Field	-	Strong Electric Field
7	COM0	O	-	-	-	47	1/2BATT	I	Active	-	Active
8	COM1	O	-	-	-	48	AVss	-	Fixed	-	-
9	---	O	-	-	-	49	VIBCNT	I/O	ON	-	OFF
10	---	O	-	-	-	50	LD	I/O	OFF	-	ON
11	S0	O	-	-	-	51	FLIP	I/O	OFF	-	Flip ON
12	S1	O	-	-	-	52	POWER	I/O	ON	-	OFF
13	S2	O	-	-	-	53	BUZ	I/O	Active	-	Active
14	S3	O	-	-	-	54	RXD	I/O	Active	-	Active
15	S4	O	-	-	-	55	TXD	I/O	Active	-	Active
16	S5	O	-	-	-	56	SCLK	I/O	Active	-	Active
17	S6	O	-	-	-	57	MICOFF	I/O	-	HiINP	-
18	S7	O	-	-	-	58	OUTCNT	I/O	Headset	HiINP	-
19	S8	O	-	-	-	59	BATTMES	I/O	Battery Voltage Check	HiINP	-
20	S9	O	-	-	-	60	CALLCNT	I/O	Call on SUB SP	HiINP	-
21	S10	O	-	-	-	61	CTCSSDET	I/O	Receiving Code	-	0.7Vdd ~ Vdd
22	S11	O	-	-	-	62	SD1	I/O	-	-	SUBSP ON
23	S12	O	-	-	-	63	SD0	I/O	-	-	MAINSP ON
24	S13	O	-	-	-	64	LED	I/O	-	-	BACK LIGHT ON
25	S14	O	-	-	-	65	PTT	I/O	ON	-	OFF
26	S15	O	-	-	-	66	SCAN	I/O	ON	-	OFF
27	S16	I/O	-	-	-	67	RESET	I	ON	-	OFF
28	S17	I/O	-	-	-	68	X2	-	1MHz ~ 5MHz		
29	RXON	I/O	ON	-	OFF	69	X1	I	1MHz ~ 5MHz		
30	RX	I/O	ON	-	OFF	70	Vss0	-	Fixed	-	-
31	STB	I/O	Active	-	Active	71	Vdd0	-	-	-	Fixed
32	TXON	I/O	ON	-	OFF	72	XT2	-	-	-	-
33	TX	I/O	ON	-	OFF	73	XT1	I	-	-	-
34	SW	I/O	Active	-	Active	74	IC(VPP)	-	-	-	-
35	CTCSSSTB	I/O	Active	-	Active	75	MENU	I/O	ON	-	OFF
36	DIR	I/O	Active	-	Active	76	UP	I/O	ON	-	OFF
37	ROWCS	I/O	OFF	-	ON	77	DOWN	I/O	ON	-	OFF
38	SCHK	I/O	325	-	320	78	MONITOR	I/O	ON	-	OFF
39	Avdd	-	-	-	Fixed	79	CALL	I/O	ON	-	OFF
40	Avref	-	-	-	Fixed	80	LOCK	I/O	ON	-	OFF

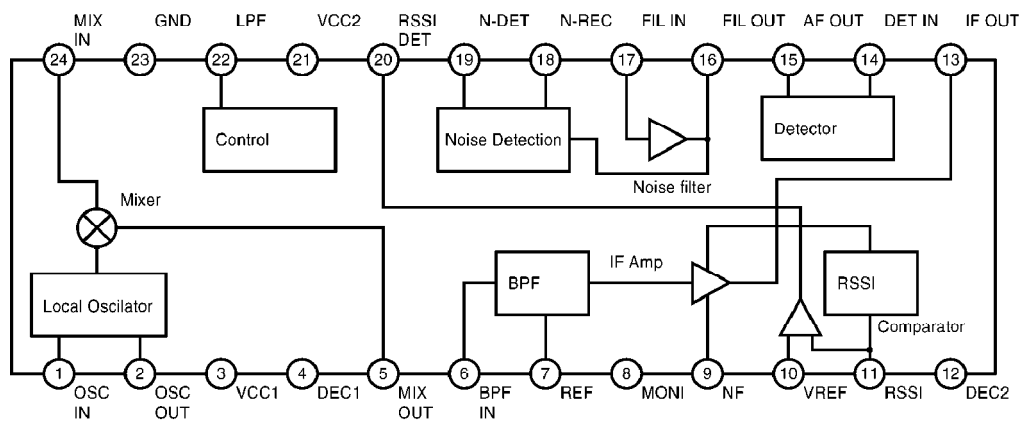
10. EXPLANATION OF IC TERMINALS (BASE BAND LSI IC11)



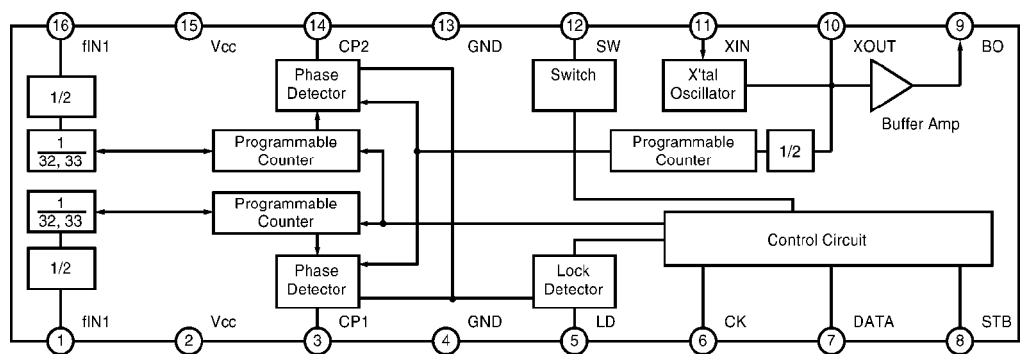
11. EXPLANATION OF IC TERMINALS (CTCSS IC IC13 PIN)



12. EXPLANATION OF IC TERMINALS (IF IC IC1)



13. EXPLANATION OF IC TERMINALS (PLL IC IC5)



14. TEST MODE SETTING

14.1. FREQUENCY TABLE


	TX, RX	CTCSS CODE
Channel/code	Frequency (MHz)	Tone Frequency (Hz)
1	446.00625	67.0
2	446.01875	71.9
3	446.03125	74.4
4	446.04375	77.0
5	446.05625	79.7
6	446.06875	82.5
7	446.08125	85.4
8	446.09375	88.5
9	446.19375 (Test mode only)	91.5
10	446.20625 (Test mode only)	94.8
11	446.23125 (Test mode only)	97.4
12	446.24375 (Test mode only)	100.0
13	446.49375 (Test mode only)	103.5
14	446.50625 (Test mode only)	107.2
15	446.53125 (Test mode only)	110.9
16	446.54375 (Test mode only)	114.8
17	446.60625 (Test mode only)	118.8
18	446.61875 (Test mode only)	123.0
19	446.64375 (Test mode only)	127.3
20		131.8
21		136.5
22		141.3
23		146.2
24		151.4
25		156.7
26		162.2
27		167.9
28		173.8
29		179.9
30		186.2
31		192.8
32		203.5
33		210.7
34		218.1
35		225.7
36		233.6
37		241.8
38		250.3

15. ADJUSTMENT

Test Mode Setting procedure

1. Remove the (6) screws of rear cabinet.
2. Unsolder the ANT lead wire, and solder the cable of Frequency counter and Linear Detector.
3. Supply DC4.5V using a DC power supply.
4. Connect the AF Generator output to TP-MIC isolation capacitor's free lead.
5. Solder the chip jumper (part No. ERJ3GEY0R00) to J1 point (refer to page 21).
6. POWER ON.
7. Press TALK switch.



8. Press  Switch 12 times.
9. Press TALK switch three times [The unit becomes test mode (CH1, code1)].
10. The unit goes into the continuous TALK mode.

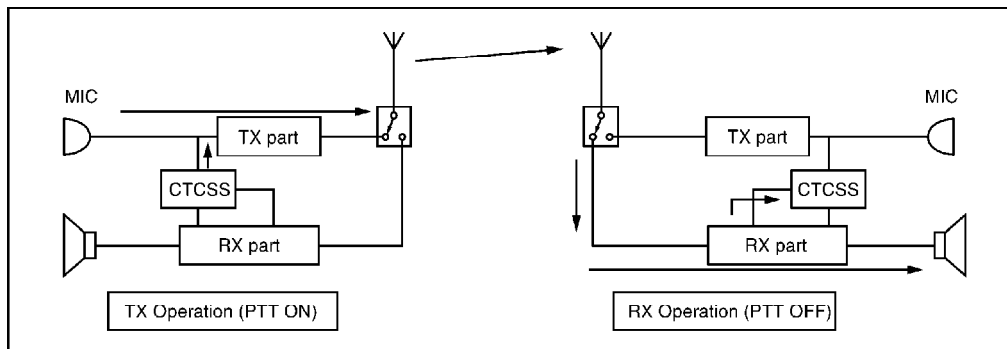
ADJUSTMENT ITEM	CONDITION	PROCEDURE
TX Frequency	Test mode (CH1, code1) Measurement point : TP-ANT End Load : 50Ω	Adjust VC1 so that the frequency counter is 446.00625MHz ±0.1kHz.
Max modulation Factor	Test mode (CH1, code1) Measurement point : TP-ANT End Load : 50Ω Mic input frequency : 1kHz Mic input level : -28dBm/600Ω Linear detector : LPF 15kHz HPF Thru	Adjust VR2 so that the linear detector is 2.3 ± 0.1kHz devi. 446.00625

Note: Test mode is the special mode that is set to confirm the fundamental operation.

16. Adjustment and Measurement Points

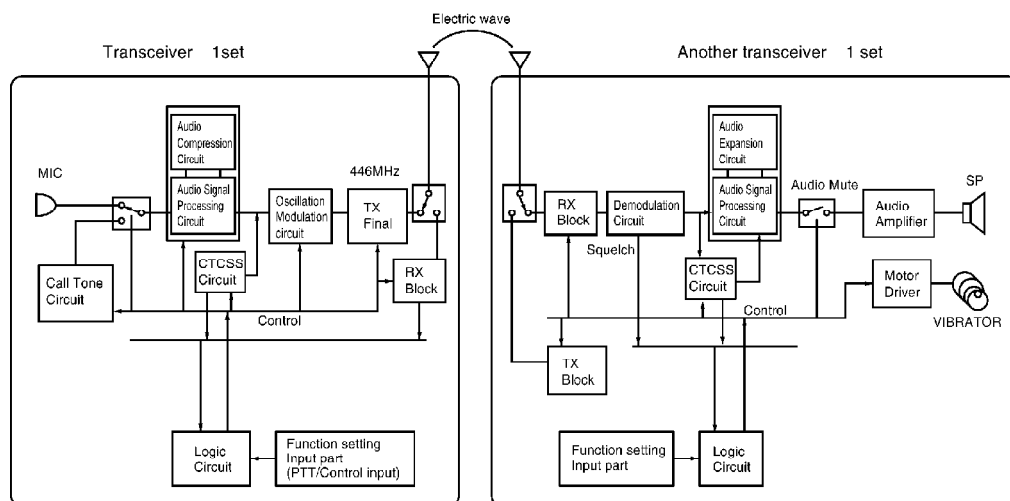
17. EXPLANATION OF 2-WAY RADIO

Different from a telephone, 2-Way radio is a basic radio which transmitter and receiver operates alternately. Therefore the simultaneous both-directed communication (Duplex) like a cordless telephone is not provided. One-way half duplex type is employed. Transmitting can be done while pushing the TALK switch, and receiving is stopped for that time. The modulation type is the normal FM (F3E) type which modulates the narrow band range. Using this tone signal of 300Hz or less, the circuit which operates the tone squelch and prevent the jammed communication is provided. This is called CTCSS. CTCSS: Continuous Tone Controlled Squelch System.



Simultaneous receiving can be done with not only specified one transceiver but many units if only the receiving channel and CTCSS code meet on RX side. Therefore, one person of a group can speak to all.

The TX/RX frequencies and channels are same. CTCSS code is provided with 38 codes from 67Hz to 250.3Hz (refer to [14.1. FREQUENCY TABLE](#)).

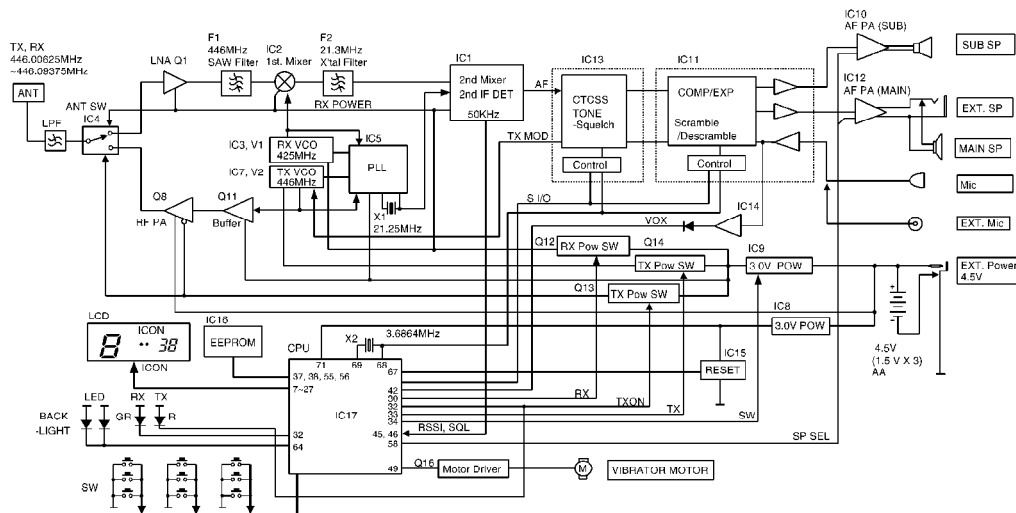


Vibrator call

As for the vibrator operation, the mode of RX side should be preset to make the operation available. The vibrator function is available even among different models. (The vibrator can be operated even by the calling sound or voice of the unit which is not equipped with the vibrator function.) The calling from other models can activate the vibrator of KX-TR 320EXS/F.

Operation Input: Channel settings, CTCSS code settings, other modes settings / Compander: Compressor/Expander

18. BLOCK DIAGRAM



19. EXPLANATION OF BLOCK DIAGRAM

19.1. Audio Frequency Circuit and Control Circuit

Circuit Operation:

Transmission

2 types of voice input are provided: built-in microphone and optional external microphone. The signal input through the microphone is amplified at the compressor (IC11), then connected to the next circuit. In the next stage (IC13) the amplified signal is passed through the splatter filter which limits the amplitude and band width. At the same time, CTCSS signal is generated and added to the voice signal, then output to RF block as a modulated signal. VOX amplifier amplifies the signal in its own route differently from the transmission voice circuit. It detects the voice and send the output to CPU. It detects the voice and sends the output to CPU through IC14. In the scramble mode the scramble circuit reverses the frequency in IC11. (Reverse Frequency 3.4 kHz)

Reception

The receiving voice is output by the demodulated signal (AF signal) from the RF block and squelch signal. AF signal is amplified in IC13 and also the CTCSS signal is divided. The detection signal of CTCSS is used for the mute control of signals. The output from IC13 is processed in IC11 further and returned by the expander, then amplifies the power to drive the speaker. (IC12: MAIN-SP/IC10: SUB-SP)

Control

The operation is controlled by CPU (IC17), LCD panel and control switch. Until running down the battery, IC (IC8) and CPU (IC17) can work with little consumption current. (some μ A) All of other circuits are shut down by power supply IC (IC9) while the power is OFF, and they are supplied the power from IC9 according to the control signal from CPU while the power ON. / The vibrator motor is driven through the transistor (Q16) according to the port output of CPU. / TX LED (red) is lighted by the power supply control (Q13) of transmission circuit on transmitting. RX LED (green) is lighted by the output of Q19 on receiving.

19.2. RX Operation

Circuit Operation:

The receiving signal from antenna ($\lambda/4$) is switched by the antenna switch (IC4), and led to RF amplifiers (Q1) to be amplified. Passing through the SAW filter (446 MHz), the signal is mixed with the 1st local at the 1st mixer (IC2) to produce the 1st IF frequency of 21.3 MHz. Then it is amplified by IF amplifier and led to IF demodulation circuit (IC1) through crystal filter (21.3 MHz). In IF demodulation circuit, the signal is mixed with 2nd local frequency of 21.25 MHz to produce the 2nd IF frequency (50 kHz). The FM of 2nd IF is detected by the demodulation circuit without coils in IC, then the voice output is gained. Also the squelch signal is output by the noise detection on demodulating. / The local frequency generation circuit consists of VCO (V1) and PLL IC (IC5). In PLL circuit the signal which is lower than RX frequency by 21.3MHz is generated as the 1st local frequency. The reference frequency of PLL employs 21.5MHz crystal with good temperature characteristics. So it is employed as the 2nd local frequency. The data from CPU is sent to PLL IC through the serial port, and according to this data PLL frequency is set.

19.3. TX Operation

Circuit Operation:

The frequency generation circuit of transmitting signal consists of VCO (V2) and PLL IC (IC5). The output from VCO is amplified at the buffer (IC7) and supplied to PLL IC, at the same time it is further amplified at the buffer (Q11) to drive the final stage output (Q8). At the final stage the power is amplified up to about 500 mW, and it is output to the antenna which is selected by the antenna switch. The low-pass filter which decreases the frequencies outside the range is provided between the antenna switch and antenna. The data from CPU is sent to PLL IC through the serial port, and according to this data PLL frequency is set as well as the RX operation. As for the modulation by the voice, the signal processed on CPU board is added to VCO directly to perform the FM modulation.

19.4. Control of TX and RX

Function:

The types of operation are TX, RX and periodical RX, and they control ON/OFF of the power supply to circuits. (Q12 and Q14 in RF block and Q13 on the CPU board side.

20. NEW CIRCUIT OPERATION

20.1. RX Operation

RF Board:

3V is supplied to TXP of Pin 11 of CN5, RX of pin 10 of CN5 becomes Low (0V), Q12 is turned on, and the reception circuit operates.

1. The signal received at the antenna is input to pin 5 of antenna switch IC4 through the low-pass filter.
2. The switching of TX/RX at IC4 are controlled by the voltage of the transmission circuit. If the voltage of pin 4 of IC4 is Low (0V), and pin 6 of IC4 is High (3V), it is switched to RX side.
3. The signal from pin 1 is amplified with RF amplifier (Q1) with which the cascade is connected, and the signal out of the range is attenuated by the SAW filter (F1).
4. Next, the amplified signal is input to pin 1 of mixer circuit (IC2), and mixed with 1st local frequency input to pin 3 of IC2.
5. 1st local frequency is oscillated in VCO (V1), amplified by IC3, and input to the mixer (IC2). Then the original signal becomes 21.3 kHz by this mixing. This signal is called 1st IF (intermediate frequency) signal. Regarding the oscillation frequency of VCO, it is controlled by PLL IC (IC5). The reference oscillation of X1 (21.25MHz) and the feed back signal from pin 4 of IC3 is input to this IC. Then, pin 14 of IC5 outputs the signal to controll VCO (V1) as a result of the comparison of these two signals to generate proper VCO frequency. That is, if the VCO frequency is higher than the ideal value, it is fed back to IC5 and IC5 outputs the signal to reduce the VCO frequency (If the feed back signal is lower than ideal value. IC5 outputs the signal to make VCO frequency higher.). The information necessary for the comparison process in IC5 is sent from the CPU as serial data.
6. The 1st IF signal output from pin 6 of IC2 passes through the filter (F2).
7. The 1st IF signal and the 2nd local frequency [reference oscillation frequency (21.25MHz) of X1] are mixed inside of IC1 (IF IC). Then 2nd IF frequency (50 kHz) is generated.
8. The 2nd IF frequency passes through the band-pass filter, amplified by IF Amp., detected by FM, then it is output from pin 15 of IC1 as AF signal.

9. At the same time, the noise of the AF signal is detected by squelch circuit in IC1 and the output is sent from pin 19 of IC1.

CPU Board:

When receiving continuously, IC9 (C3V) is turned ON and IC11 and IC13 are set to RX operation. When receiving periodically, ON/OFF of IC9 (C3V) is controlled. The followings are under the condition that C3V is ON in RX mode:

1. The AF signal output from pin 15 of IC1 is supplied to pin 23 of IC13 (CTCSS) through pin 3 of CN4, then amplified and passed through the band-pass filter to be output from pin 7.
2. IC13 checks the existence of CTCSS signal and its frequency (60 ~ 250 Hz) in AF signal. If the check result matches to the programmed conditions, it turns off the mute and AF signal is output from pin 7 of IC13.
3. The AF signal output from IC13 is led to pin 23 of IC11 and amplified to descramble passing through the filter in the scramble mode. (TR325)
4. Furthermore, the signal is returned by the expander to be output from pin 17, then it is amplified at the amplifiers of pin 18 and pin 19 to be output.
5. The voice signal is input to the pin 4 of the power amplifier of IC12 for the main speaker, and differential outputs from pin 5 and pin 8 to drive the speaker.
6. The signal for the sub-speaker is amplified one more stage in IC11 and output from pin 21. It is supplied to pin 4 of the power amplifier (IC10) for sub-speaker. Differential outputs from pin 5 and pin 8 drive-Differential is output from pin 5 and pin 8 to drive the sub-speaker.
7. 2 amplifiers are turned ON/OFF by the control terminals (pin 1 (SD0, SD1)) respectively. (They don't work at the same time.)
8. The output terminal of main speaker is connected to the speaker through the external output terminal (CN2).
9. When the external speaker (headset/speaker microphone) is

connected, the built-in speakers (Main, Sub) is cut off and the external speaker is driven.

20.2. TX Operation

RF Board:

During TX operation 3V is supplied from TXP of pin 11 of CN5 causing TX of pin 12 to Low (0V) and Q14 to be turned ON to work the TX circuit. At that time RX of pin 10 becomes High (3V) and Q12 is turned OFF, then the RX circuit stops working.

- 1. VR2 adjusts the level of the modulation signal (MOD) of CN5, then the signal is input to the modulation terminal of VCO for TX (V2) pin 3.**
- 2. VCO (V2) oscillates by the TX frequency, amplified at IC7 and led to pin 1 of PLL (IC5). The oscillation frequency of VCO is controlled by PLL (IC5) divides the reference frequency of 21.25 MHz, and locks the frequency at 12.5 kHz step (phase comparison frequency: 6.25kHz). The ratio of dividing frequency output from CPU is programmed to the internal register from pin 7 as the serial data.**
- 3. The output from pin 4 of IC7 is input to Q11 (RF amplifier). The power amplifier Q8 boosts the signal (approx.25 dBm) and the signal is sent to pin 3 of IC4 (antenna switch).**
- 4. The signal is output from pin 5 of IC4, passes through the low pass filter, and it is transmitted from the antenna. At that time, the antenna and pin 3 of IC4 is connected because pin 4 of IC4 is high (Tx power on).**

CPU Board:

When the TX operations, CPU programs the TX mode. IC 9 (C3V) is turned ON when transmitting, and IC11 and IC13 are set to TX operation.

- 1. The voice input from microphone is sent to pin 3 of IC11 and amplified. Then the amplitude is compressed at the compressor circuit and scrambled. After limiting the amplitude, the signal is output from pin 6 through the filter. At the same time the input signal from the microphone is sent to pin 6 of IC14 to be**

- amplified, then rectified by diode D4. The rectified DC level is input to pin 3 of IC14 and amplified to be output from pin 1. (DC output can be chosen according to the loudness of voice input.) The output from pin 1 is supplied to pin 42 of CPU (IC17), and read by A/D converter to become the trigger of transmission.
2. The output from pin 6 of IC11 is supplied to pin 1 of IC13 and amplified then output to pin 6 through the splatter filter.
 3. Also in IC13, the tone generator circuit outputs CTCSS signal (60 ~ 250 Hz) from pin 16 continuously corresponding to programmed CODE. These signals are added at the amplifier input pin 5 and output from pin 4.
 4. The output from pin 4 of IC13 is supplied to RF block passing through connector CN4 and CN5.

20.3. Other operation

LCD:

LCD on CPU board consists of 2 common terminals (pin 18, 19) and 17 segment terminals (pin 1 ~ 17), and it is driven by CPU directly using the method of 1/2 duty dynamic lighting.

EEPROM:

EEPROM on CPU board is connected to CPU directly with the serial signal, all kinds of setting items are reserved. The default setting and the change of the settings in daily use are always reserved.

CPU:

8 bit/chip built-in ROM type-CPU are employed, LCD direct drive, built-in A/D convertor and serial port are provided.

X2:

The crystal oscillator of 3.6864 MHz on CPU board, which is used as CPU clock, the reference for CTCSS (tone signal) and for the generation of the reference frequency of scramble process. The required accuracy by CTCSS is $1/250=0.4\%$. The crystal is 50 ppm.

RESET IC:

IC15 on CPU board is the RESET IC, which resets the CPU when the battery voltage becomes 2V or below. On the contrary, when the voltage is more than 2V, it releases the RESET mode

and boots the CPU normally.

Voltage Regulator IC:

IC8 on CPU board is the voltage regulator IC with the low-consumption current of 3 volt and it always supplies 3V to CPU.

Voltage Regulator IC:

IC9 on CPU board is the voltage regulator IC with the low-consumption current of 3 volt equipped with control terminal. It is controlled by CPU to output C3V.

LED:

LED3 on CPU board is lighted up to indicate TX and RX: Busy. The green LED controlled by CPU port is driven at Q19 while RX:Busy, and red LED is driven at Q13 while TX:Transmit.

LED:

LED1 and 2 is lighted up green for a fixed time as the back light during key operation. It is controlled by pin 64 of the CPU port and driven at Q15.

Battery Voltage Detection:

Q18 on CPU board is used to check the battery voltage. While detecting the voltage, the gate of Q18 becomes LOW by CPU port (pin 59), the voltage of the battery appears at the drain of Q18. The voltage is divided by R62 and R63, and read by A/D input (pin 47), then the battery indication appears on LCD.

External Microphone:

The external microphone connected to CN1 on CPU board causes the short between the terminals 2 and 3 of CN1. In result the gate of Q17 and built-in microphone are connected to earth. The signal from the built-in microphone is shut down and the signal from the external microphone is supplied to pin 3 of IC11 via pin 1 of CN1.

21. TROUBLESHOOTING GUIDE

21.1. Transmission Trouble/ RF Circuit

Condition

Channel No. Setup

Standard Modulation (1KHz) Input

C3V Applied

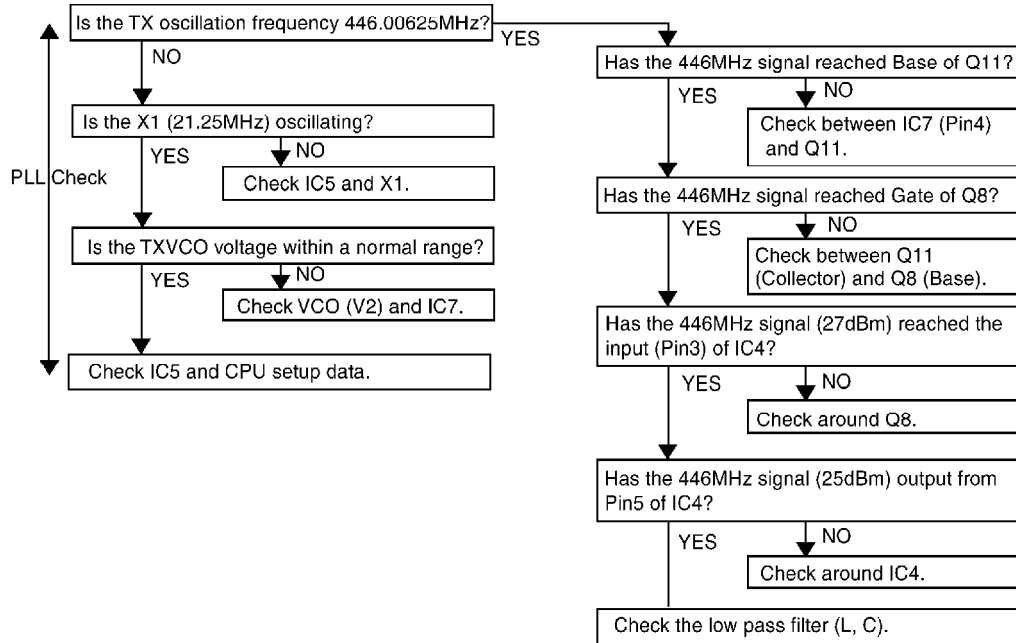
MOD Signal: Pin9 (CN5) Check

TXP (3V): Pin11 (CN5)

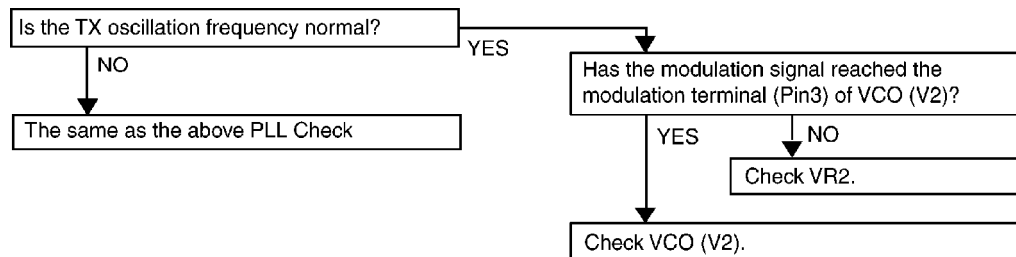
TX (LOW): Pin12 (CN5)

Selecting CH1

21.1.1. RF Output Is Not Output To ANT Terminal.



21.1.2. Modulation Does Not Work In Transmission.



21.2. Transmission Trouble/ AF Circuit

Condition

Channel No. Setup

Standard Modulation (1KHz) Input

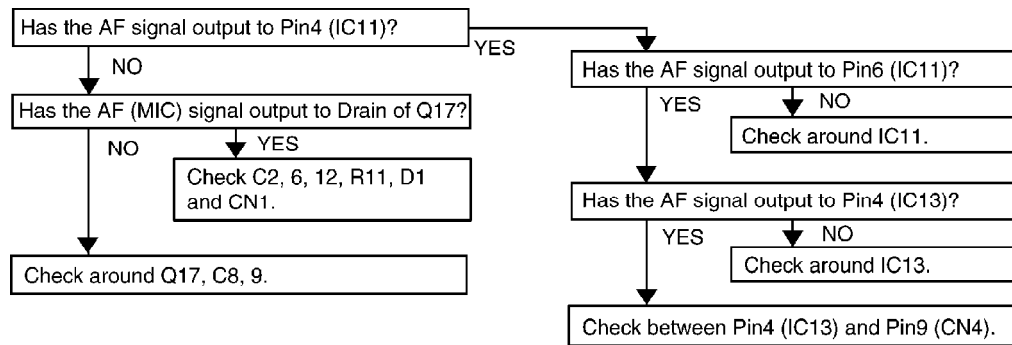
C3V Applied

MIC Input Check

TXP (3V): Pin11 (CN5)

TX (LOW): Pin12 (CN5)

21.2.1. Modulation Does Not Work.

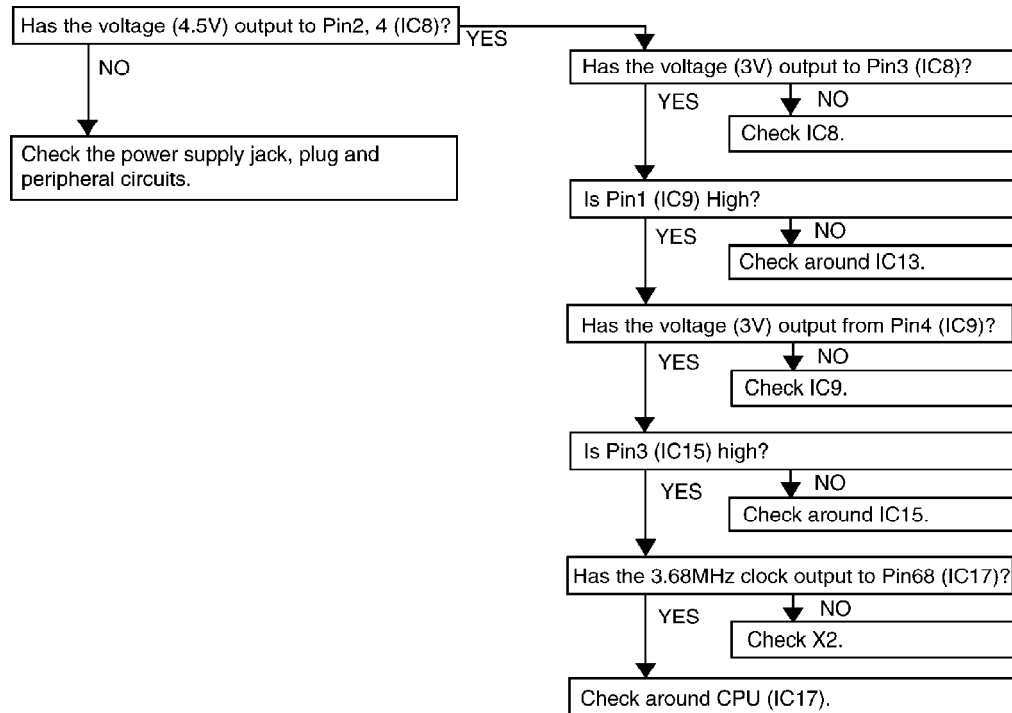


21.3. Control Circuit

Condition

Voltage (4.5V) Supplied from External Power Source

21.3.1. Power Supply Will Not Be ON.



21.4. Reception Trouble/ RF Circuit

Condition

Channel No. Setup

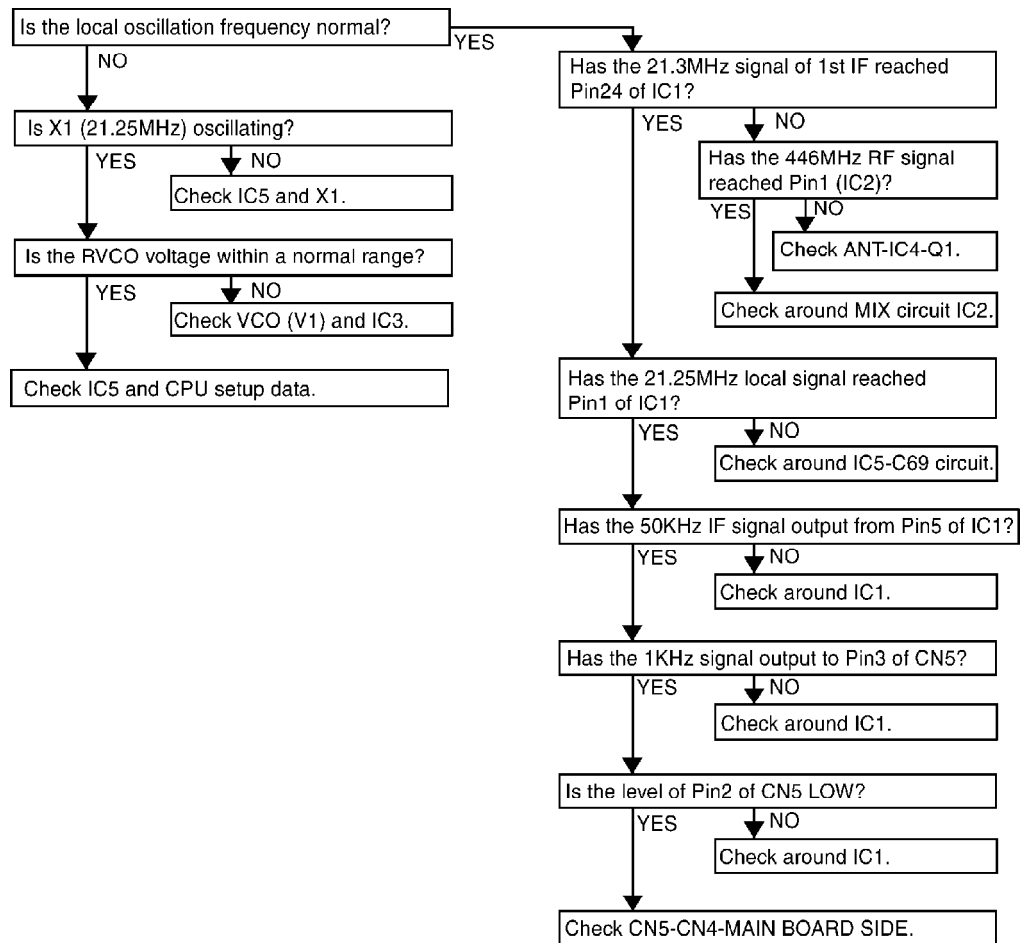
SSG Frequency Setup

Standard Modulation (1KHz)

C3V Normally Applied

CN5 (Pin10: RX) LOW

21.4.1. Cannot Receive



21.5. Reception Trouble/ AF Circuit

Condition

Channel No. Setup

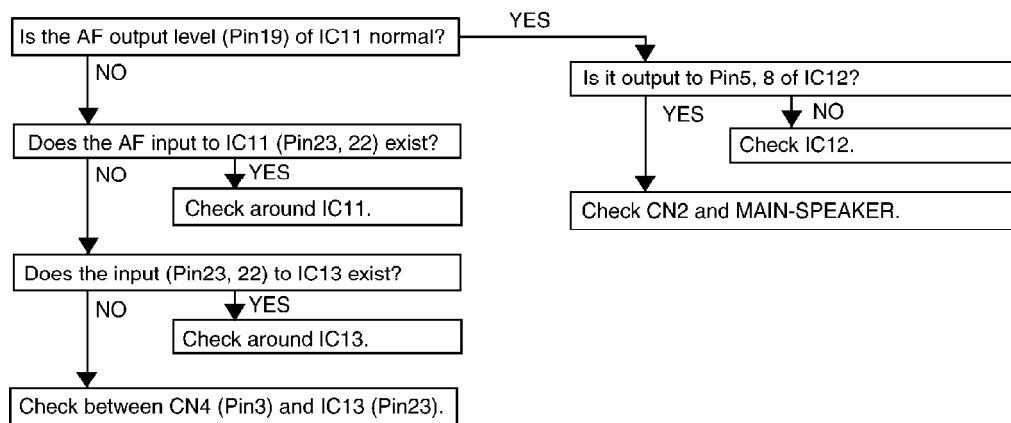
SSG Frequency Setup

Standard Modulation (1KHz)

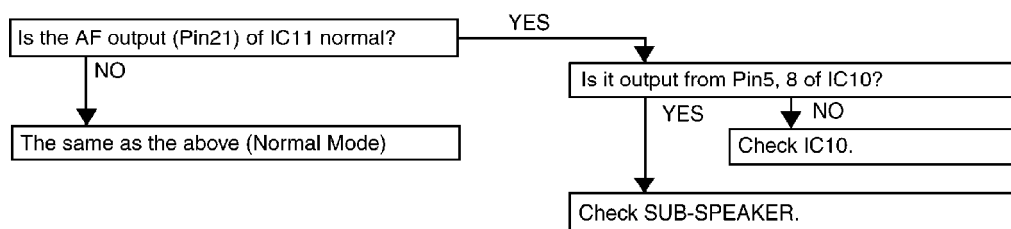
C3V Applied

AF Signal: Pin3 (CN4) Check

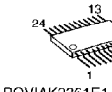


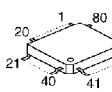
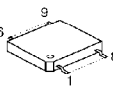
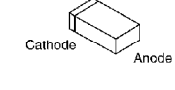
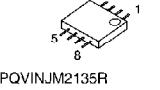

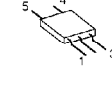
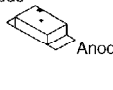
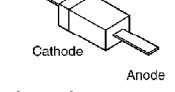
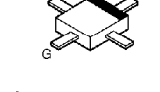

21.5.1. PTT Mode



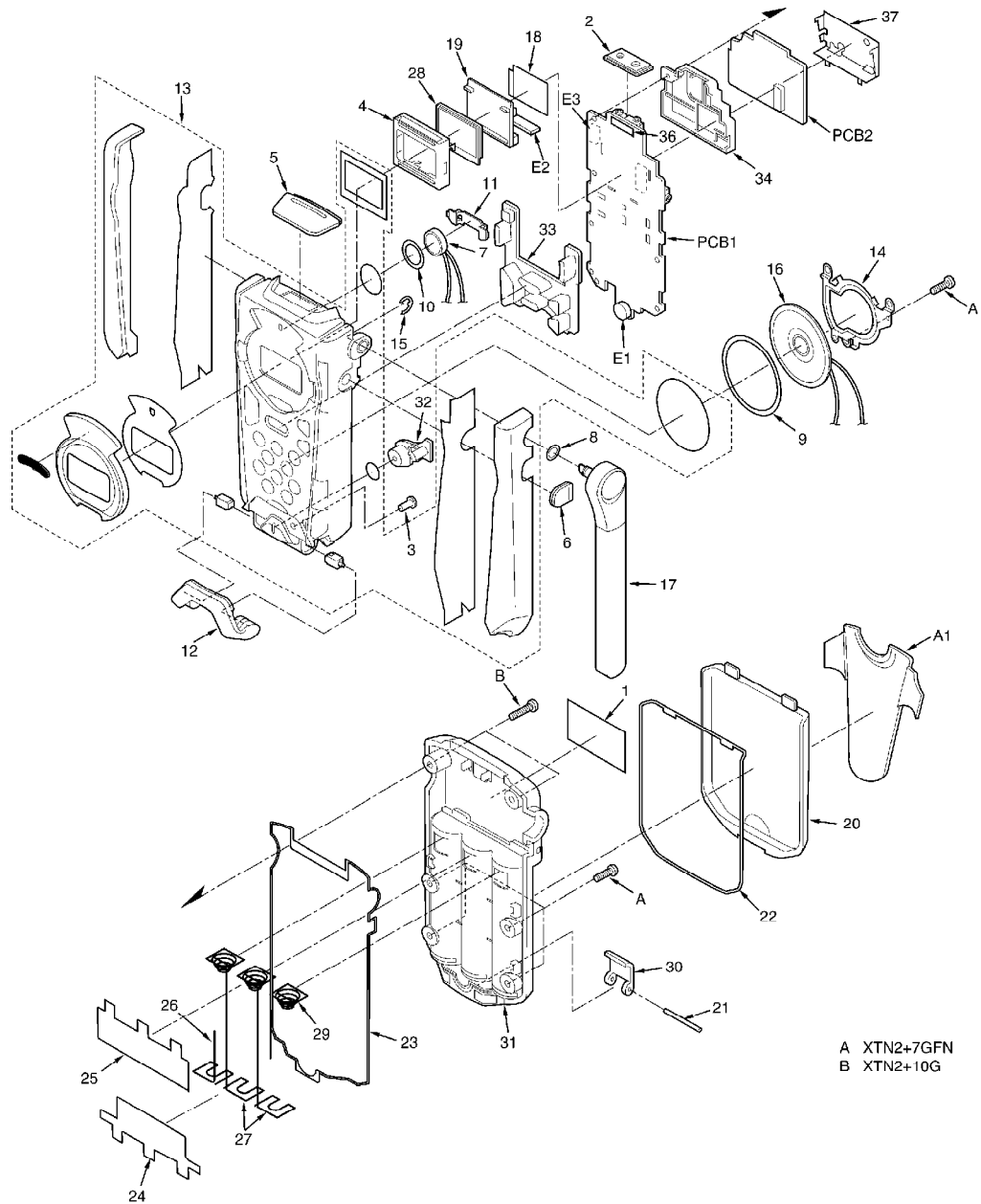
21.5.2. Private Mode



22. TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES

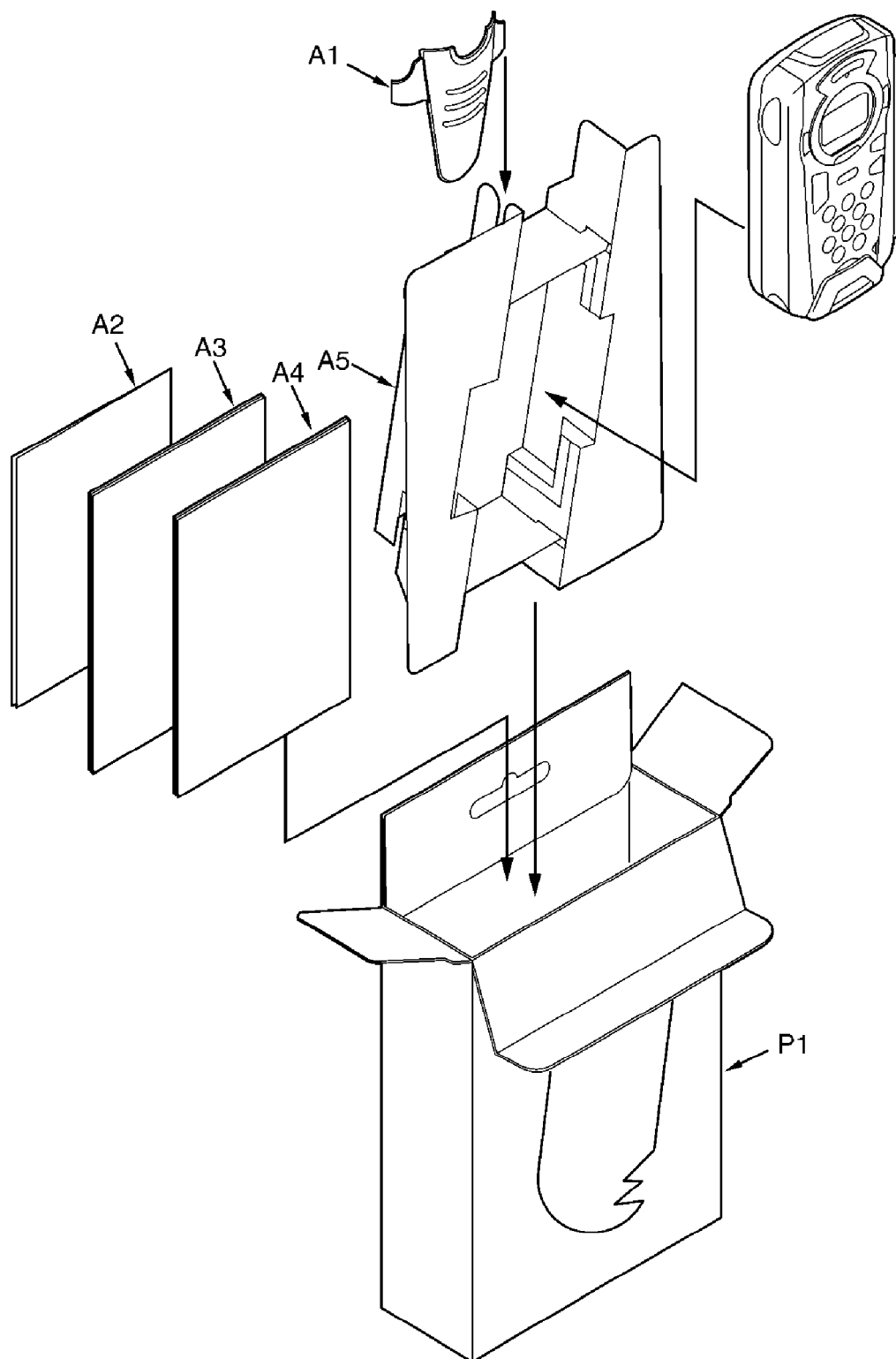
 <p>PQVIAK2361E1 PQVIAK2345E2 PQVITA31180F</p>	 <p>2SC5463, 2SK1581 PQVTDTA114EU PQVTGN1A3QT1 11SS372, PQVTDTC114EU 2SJ461</p>	 <p>LN115W8PRA</p>	 <p>PQVI9407AA28</p>	 <p>PQVITB31202F</p>
 <p>Cathode Anode MA8150 ISS372</p>	 <p>PQVINJM2135R PQVINJU7015R PQWI2TR325SH</p>	 <p>PQVIMM3033AU PQVIPS9320UT</p>	 <p>PQVIMM1385HN</p>	 <p>Cathode Anode PQVDSML310MT</p>
 <p>Cathode Anode PQVDNND56DT</p>	 <p>PQVTN510279A</p>	 <p>PQVIPG153TBE PQVIPG2757TE PQVIPC8151TA PQVIPC2763TE</p>		

23. CABINET AND ELECTRICAL PARTS

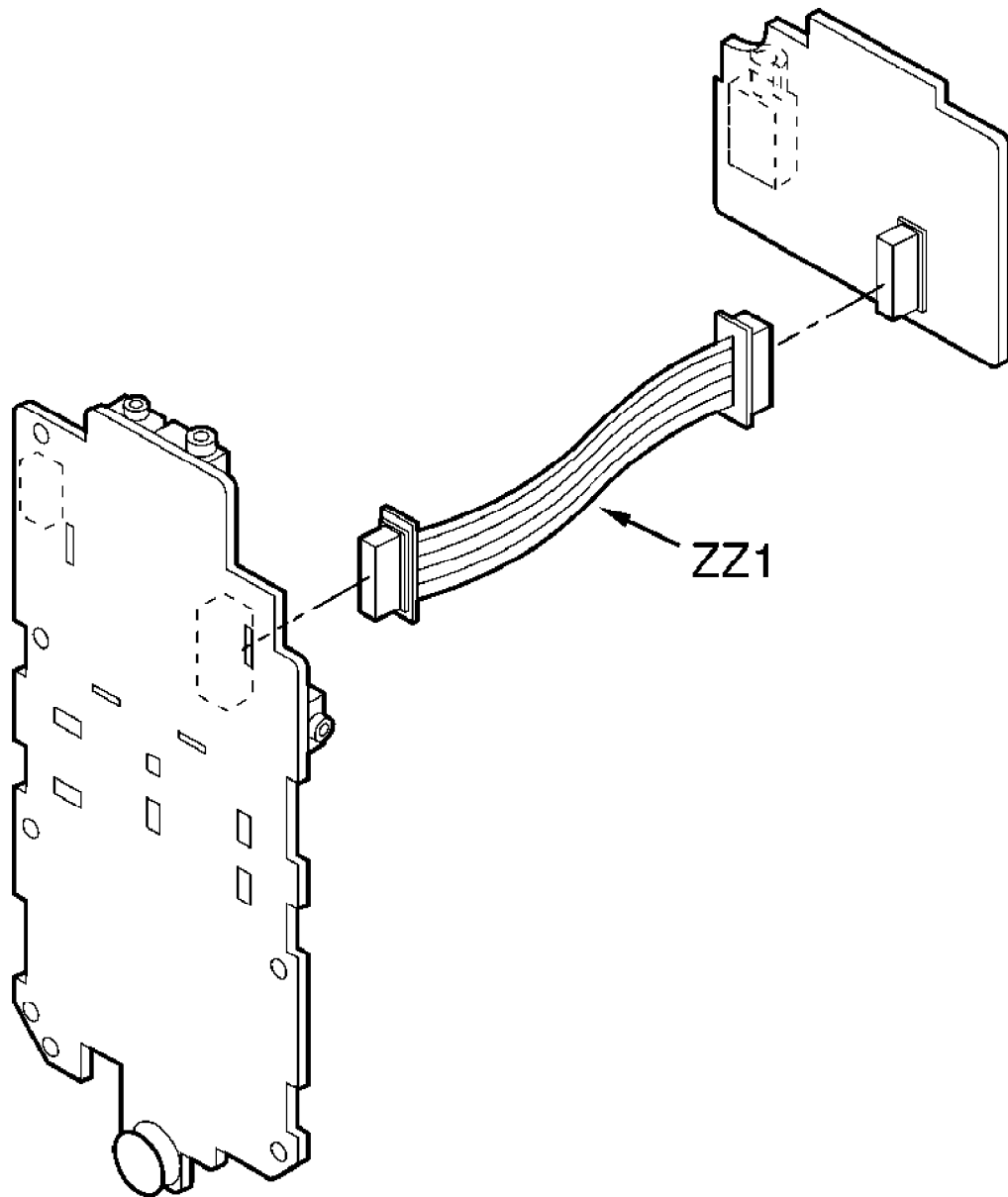


A XTN2+7GFN
B XTN2+10G

24. ACCESSORY AND PACKING MATERIALS



25. TOOL



26. REPLACEMENT PARTS LIST

This replacement parts list is for KX-TR320EXF/KX-TR320EXS only.


Refer to the simplified manual (cover) for other areas.

Notes:

1. The marking (RTL) indicates that the Retention Time is limited for this item.

After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependent on the type of assembly, and in accordance with the laws governing parts and product retention.

After the end of this period, the assembly will no longer be available.

2. Important safety notice / Components identified by the  mark have special characteristics important for safety. When replacing any of these components, use only manufacture's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS / Unless otherwise specified; / All resistors are in ohms (Ω) K=1000 Ω , M=1000k Ω / All capacitors are in MICRO FARADS (μ F) P= μ μ F / *Type & Wattage of Resistor

Type					
ERC:Solid ERD:Carbon PQ4R:Chip		ERX:Metal Film ERG:Metal Oxide ERO:Metal Film		PQRD:Carbon PQRQ:Fuse ERF:Wire Wound	
Wattage					
10,16,18:1/8W	14,25,S2:1/4W	12,50,S1:1/2W	1:1W	2:2W	5:5W
ECFD:Semi-Conductor ECQS:Styrol PQCBX,ECUV:Chip ECMS:Mica		ECCD,ECKD,PQCBC,PQVP : Ceramic ECQM,ECQV,ECQE,ECQU,ECQB : Polyester ECEA,ECSZ,ECOS : Electrolytic ECQP : Polypropylene			
Voltage					
ECQ Type	ECQG ECQV Type	ECSZ Type	Others		
1H : 50V 2A : 100V 2E : 250V 2H : 500V	05 : 50V 1 : 100V 2 : 200V	OF : 3.15V 1A : 10V 1V : 35V OJ : 6.3V	OJ : 6.3V 1A : 10V 1C : 16V 1E,25 : 25V	1V : 35V 50,1H : 50V 1J : 63V 2A : 100V	

26.1. Base Unit

26.1.1. CABINET AND ELECTRICAL PARTS

Ref. No.	Part No.	Part Name & Description	Remarks
1	PQGT14378Z	NAME PLATE (for KX-TR320EXS)	
1	PQGT14377Z	NAME PLATE (for KX-TR320EXF)	
2	PQHG10568Z	PACKING RUBBER	
3	PQHR10734Y	SWITCH KNOB	
4	PQMH10394Z	LCD HOLDER	
5	PQKE10092Z1	JACK COVER, RUBBER	S
6	PQKE10093Z1	DC JACK COVER, RUBBER	S
7	PQAS13P01Z	SPEAKER	
8	PQHG10570Z	PACKING RUBBER, ANTENNA	
9	PQHG10574Y	PACKING RUBBER, MAIN SPEAKER	
10	PQHG10575Z	PACKING RUBBER, EAR SPEAKER	
11	PQHR10718Z	SP HOLDER	
12	PQKK10098Z1	FLIP	S
13	PQYMFR320S	FRONT CABINET ASS'Y (for KX-TR320EXS)	
13	PQYMFR320F	FRONT CABINET ASS'Y (for KX-TR320EXF)	
14	PQMS10011Z	SPEAKER PLATE	
15	XUC25VW-V	RETAINNING RING	
16	PQAS36P02Y	SPEAKER	
17	PQSA10116Z	ANTENNA	
18	PQHX10907Z	REFLECTOR SHEET	
19	PQHR10719Z	LCD HOLDER	
20	PQKK10097Y1	BATTERY COVER	S
21	PQDF10094Z	SHAFT	
22	PQHG10566Z	PACKING RUBBER, BATTERY	
23	PQHG10567Z	PACKING RUBBER, CABINET	
24	PQHS10415Z	SHEET	
25	PQHS10416Z	SHEET	
26	PQJC10040Z	BATTERY TERMINAL	
27	PQJC10041Z	BATTERY TERMINAL	
28	PQADM0541R22	LIQUID CRYSTAL DISPLAY	
29	PQJC10042Z	BATTERY TERMINAL	
30	PQKE10096Z1	BATTERY LEVER	S
31	PQKF10309V1	REAR CABINET	S
32	PQSX10126Z	RUBBER SWITCH	
33	PQSX10127Z	RUBBER SWITCH	
34	PQHR10720X	RF HOLDER	
36	PQHX10949Z	SHEET	
37	PQMC10395Z	ELECTRIC SHIELD, RF	

26.1.2. ACCESSORIES AND PACKING MATERIAL

Ref. No.	Part No.	Part Name & Description	Remarks
A1	PQKE10094Z1	BELT CLIP	S
A2	PQQW12312Z	LEAFLET	
A3	PQQX12842Z	INSTRUCTION BOOK	
A4	PQQX12843Z	INSTRUCTION BOOK	
A5	PQPD10468Z	CUSHION	
		(PACKING MATERIALS)	
P1	PQPK13240Z	GIFT BOX	

26.1.3. MAIN P.C.BOARD PART

Ref. No.	Part No.	Part Name & Description	Remarks
PCB1	PQWP1R320EXF	CPU P. C. BOARD ASS'Y (RTL)	
		(ICS)	
IC8	PQVIMM3033AU	IC	
IC9	PQVIMM1385HN	IC	
IC10	PQVINJM2135R	IC	
IC11	PQVIAK2361E1	IC	
IC12	PQVINJM2135R	IC	
IC13	PQVIAK2345E2	IC	
IC14	PQVINJU7015R	IC	
IC15	PQVIPS9320UT	IC	
IC16	PQWI2TR325SH	IC	
IC17	PQVI9407AA28	IC	
		(TRANSISTORS)	
Q13	PQVTGN1A3QT1	TRANSISTOR(SI)	
Q15	PQVTDTC114EU	TRANSISTOR(SI)	
Q17	2SK1581	TRANSISTOR(SI)	
Q18	2SJ461	TRANSISTOR(SI)	
Q19	PQVTDTA114EU	TRANSISTOR(SI)	
		(DIODES)	
D1	PQVDNCD56DT	DIODE(SI)	S
D2	PQVDNCD56DT	DIODE(SI)	S
D3	PQVDNCD56DT	DIODE(SI)	S
D4	1SS372	DIODE(SI)	
D5	MA8150	DIODE(SI)	
		(LEDS)	
LED1	PQVDSML310MT	LED	S
LED2	PQVDSML310MT	LED	S
LED3	LNJ115W8PRA	LED	
		(JACK/SOCKETS)	
CN1	PQJJ1C008Z	JACK/SOCKET	
CN2	PQJJ1D019Z	JACK/SOCKET	
CN3	PQJJ1B006Z	JACK/SOCKET	
CN4	PQJS20B34Z	JACK/SOCKET	
		(COILS)	
L18	PQLQR1RW601	COIL	
L19	PQLQR1RW601	COIL	
		(OTHERS)	
E1	PQJM149Y	MICROPHONE	
E2	PQJE10103Z	CONNECTOR	
E3	PQSH1A44Z	PUSH SWITCH	

Ref. No.	Part No.	Part Name & Description	Remarks
X2	PQVCF3686N8Z	CRYSTAL OSCILLATOR	
		(CAPACITORS)	
C1	ECUV1C104KBV	0.1	
C2	ECUV1C104KBV	0.1	
C3	ECUV1A105ZFV	1	
C4	ECUV1A105ZFV	1	
C6	ECUV1C104KBV	0.1	
C7	ECUV1H103KBV	0.01	
C8	ECUV1H101JCV	100P	
C9	ECUV1A105ZFV	1	
C10	ECUV1A105ZFV	1	
C11	ECUV1A105ZFV	1	
C12	ECUV1A105ZFV	1	
C13	ECUV1C104KBV	0.1	
C14	ECUV1H102KBV	0.001	
C15	ECUV1C104ZFV	0.1	
C16	ECUV1H330JCV	33P	
C17	ECST0JY106	10	
C18	ECUV1C104KBV	0.1	
C19	ECUV1C104KBV	0.1	
C20	ECUV1A224KBV	0.22	
C21	ECUV1H470JCV	47P	
C22	ECUV1C104KBV	0.1	
C23	ECUV1H470JCV	47P	
C24	ECUV1H223KBV	0.022	
C25	ECUV1H821KBV	820P	
C26	ECUV1A105ZFV	1	
C27	ECUV1H333KBV	0.033	S
C28	ECUV1H102KBV	0.001	
C29	ECUV1H331JCV	330P	
C30	ECUV1A105ZFV	1	
C31	ECUV1H102KBV	0.001	
C32	ECUV1C104ZFV	0.1	
C33	ECUV1A105ZFV	1	
C34	ECUV1C104ZFV	0.1	
C35	ECUV1H101JCV	100P	
C36	ECUV1H103KBV	0.01	
C37	ECST0JY106	10	
C38	ECUV1A105ZFV	1	
C39	ECUV1C104KBV	0.1	
C40	ECUV1H103KBV	0.01	
C41	ECUV1H102KBV	0.001	
C42	ECUV1C104ZFV	0.1	
C43	ECUV1A105ZFV	1	
C44	ECUV1C104KBV	0.1	
C45	ECUV1C104KBV	0.1	
C46	ECUV1A105ZFV	1	
C47	ECUV1H220JCV	22P	

Ref. No.	Part No.	Part Name & Description	Remarks
C48	ECUV1H220JCV	22P	
C49	ECUV1C104ZFV	0.1	
C50	ECUV1C104ZFV	0.1	
C51	ECST0JY106	10	
C52	ECUV1C104ZFV	0.1	
C53	ECUV1C104ZFV	0.1	
C54	ECST0JY106	10	
C55	ECUV1C104ZFV	0.1	
C57	ECST0JX476	47	
C58	ECUV1C104ZFV	0.1	
C59	ECST0JY106	10	
C60	ECST0JY106	10	
C61	ECUV1C104ZFV	0.1	
C62	ECUV1C104ZFV	0.1	
C63	ECUV1C104ZFV	0.1	
C180	ECUV1H102KBV	0.001	
C181	ECUV1H102KBV	0.001	
C182	ECUV1H102KBV	0.001	
C183	ECUV1H102KBV	0.001	
C184	ECUV1H102KBV	0.001	
C185	ECUV1H470JCV	47P	
C186	ECUV1H102KBV	0.001	
C187	ECUV1H470JCV	47P	
C188	ECUV1H470JCV	47P	
C189	ECUV1H470JCV	47P	
C190	ECUV1H470JCV	47P	
C191	ECUV1H102KBV	0.001	
C192	ECUV1H102KBV	0.001	
C193	ECUV1H101JCV	100P	
C194	ECUV1H101JCV	100P	
C195	ECUV1H102KBV	0.001	
C196	ECUV1H333KBV	0.033	S
C197	ECUV1H101JCV	100P	
RF P. C. BOARD PARTS			
PCB2	PQWP2R320EXF	RF P. C. BOARD ASS'Y (RTL)	
		(ICS)	
IC1	PQVITA31180F	IC	
IC2	PQVIPC2757TE	IC	
IC3	PQVIPC8151TA	IC	
IC4	PQVIPG153TBE	IC	
IC5	PQVITB31202F	IC	
IC7	PQVIPC2763TE	IC	

Ref. No.	Part No.	Part Name & Description	Remarks
		(TRANSISTORS)	
Q1	2SC5463	TRANSISTOR(SI)	
Q8	PQVTN510279A	TRANSISTOR(SI)	
Q11	2SC5463	TRANSISTOR(SI)	
Q12	PQVTGN1A3QT1	TRANSISTOR(SI)	
Q14	PQVTGN1A3QT1	TRANSISTOR(SI)	
		(CRYSTAL OSCILLATOR)	
F2	PQVCMMF213MT	CRYSTAL OSCILLATOR	
V1	PQV058Z	CRYSTAL OSCILLATOR	
V2	PQV059Z	CRYSTAL OSCILLATOR	
X1	PQVCB2125N1Z	CRYSTAL OSCILLATOR	
		(COILS)	
L1	MQLRE10NJF	COIL	
L2	PQLQR4D1R0K	COIL	
L3	MQLRE10NJF	COIL	
L4	MQLRER10JF	COIL	
L5	MQLRE22NJF	COIL	
L6	PQLQR1RW601	COIL	
L7	PQLQX1A14R3	COIL	
L8	PQLQX1A14R3	COIL	
L9	MQLRE12NJF	COIL	
L10	MQLRE5N6JF	COIL	
L11	MQLRE22NJF	COIL	
L12	MQLRE18NJF	COIL	
L13	MQLRE12NJF	COIL	
L14	PQLQR1RW601	COIL	
L15	PQLQR1RS220	COIL	
L16	PQLQR1RS220	COIL	
L20	PQLQX1A14R3	COIL	
		(OTHERS)	
CN5	PQJP20B89Z	CONNECTOR	
F1	PQVSSFS446P0	CERAMIC FILTER	
VC1	PQCVTZV0200R	TRIMMER CAPACITOR	
VR2	EVN5ESX50B14	VARIABLE RESISTOR	S
		(RESISTORS)	
R68	ERJ3GEYJ151	150k	
R69	ERJ3GEYJ122	1.2k	
R71	ERJ3GEYJ472	4.7k	
R72	ERJ3GEYJ332	3.3k	
R73	ERJ3GEYJ470	47k	

Ref. No.	Part No.	Part Name & Description	Remarks
R75	ERJ3GEYJ470	47k	
R76	ERJ3GEYJ102	1k	
R77	ERJ3GEYJ220	22k	
R78	ERJ3GEYJ473	47k	
R79	ERJ3GEYJ562	5.6k	
R80	ERJ3GEYJ154	150k	
R81	ERJ3GEYJ684	680k	
R82	ERJ3GEYJ102	1k	
R83	ERJ3GEYJ472	4.7k	
R84	ERJ3GEYJ473	47k	
R85	ERJ3GEYJ124	120k	
R86	ERJ3GEYJ101	100	
R87	ERJ3GEYJ183	18k	
R88	ERJ3GEYJ470	47k	
R89	ERJ3GEYJ473	47k	
R90	ERJ3GEYJ473	47k	
R91	ERJ3GEYJ103	10k	
R92	ERJ3GEYJ102	1k	
R94	ERJ3GEYJ102	1k	
R95	ERJ3GEYJ681	680k	
R96	ERJ3GEYJ102	1k	
R97	ERJ3GEYJ222	2.2k	
R98	ERJ3GEYJ180	18k	
R99	ERJ3GEYJ105	1M	
R102	ERJ3GEYJ561	560k	
R103	ERJ3GEYJ272	2.7k	
R104	ERJ3GEYJ151	150k	
		(CAPACITORS)	
C64	ECUV1H102KBV	0.001	
C65	ECUV1H102KBV	0.001	
C66	ECUV1H100DCV	10P	
C67	ECUV1H030CCV	3P	
C68	ECUV1H470JCV	47P	
C69	ECUV1H102KBV	0.001	
C70	ECUV1H101JCV	100P	
C72	ECUV1H102KBV	0.001	
C74	ECUV1H103KBV	0.01	
C75	ECUV1C104ZFV	0.1	
C76	ECUV1C104ZFV	0.1	
C77	ECST0JY106	10	
C78	ECUV1A105ZFV	1	
C79	ECUV1C104ZFV	0.1	
C80	ECUV1H060DCV	6P	S
C81	ECUV1H103KBV	0.01	
C82	ECUV1H101JCV	100P	
C83	ECUV1H103KBV	0.01	
C84	ECUV1H103KBV	0.01	

Ref. No.	Part No.	Part Name & Description	Remarks
C85	ECUV1A474KBV	0.47	
C86	ECST0JY106	10	
C87	ECUV1H331JCV	330P	
C88	ECUV1H102KBV	0.001	
C89	ECUV1H102KBV	0.001	
C90	ECUV1H050CCV	5P	
C91	ECUV1C104ZFV	0.1	
C92	ECUV1H331JCV	330P	
C93	ECUV1H103KBV	0.01	
C94	ECUV1H103KBV	0.01	
C95	ECUV1H102KBV	0.001	
C96	ECUV1H103KBV	0.01	
C97	PQCUV1C224KB	0.22	
C98	ECUV1A105ZFV	1	
C99	ECUV1H103KBV	0.01	
C100	ECUV1H330JCV	33P	S
C101	ECUV1H102KBV	0.001	
C102	ECUV1A105ZFV	1	
C103	ECUV1H060DCV	6P	S
C104	ECUV1H120JCV	12P	
C105	ECUV1H120JCV	12P	
C106	ECUV1H103KBV	0.01	
C107	ECUV1H150JCV	15P	
C108	ECUV1H200JCV	20P	
C109	ECUV1H102KBV	0.001	
C110	ECUV1H103KBV	0.01	
C112	ECUV1C104KBV	0.1	
C113	ECUV1H472KBV	0.0047	
C114	ECST0JY106	10	
C115	ECUV1H103KBV	0.01	
C116	ECST0JY106	10	
C117	ECUV1H103KBV	0.01	
C118	ECUV1H103KBV	0.01	
C119	ECUV1H200JCV	20P	
C120	ECUV1H020CCV	2P	
C121	ECUV1H060DCV	6P	S
C122	ECUV1H040CCV	4P	
C123	ECUV1H100DCV	10P	
C124	ECUV1H103KBV	0.01	
C127	ECUV1H150JCV	15P	
C128	ECST0JY106	10	
C129	ECUV1H102KBV	0.001	
C130	ECUV1H102KBV	0.001	
C131	ECUV1H102KBV	0.001	
C132	ECUV1H102KBV	0.001	
C133	ECUV1H102KBV	0.001	
C134	ECUV1H102KBV	0.001	
C135	ECUV1H103KBV	0.01	
C136	ECUV1H103KBV	0.01	

Ref. No.	Part No.	Part Name & Description	Remarks
C137	ECUV1H220JCV	22P	
C138	ECUV1H180JCV	18P	
C139	ECUV1H102KBV	0.001	
C140	ECUV1H102KBV	0.001	
C141	ECUV1H060DCV	6P	S
C142	ECUV1H101JCV	100P	
C143	ECUV1H101JCV	100P	
C144	ECUV1H101JCV	100P	
C145	ECUV1H101JCV	100P	
C146	ECUV1H102KBV	0.001	
C200	ECUV1H472KBV	0.0047	
		(RESISTORS)	
R1	ERJ3GEYJ104	100k	
R2	ERJ3GEYJ104	100k	
R3	ERJ3GEYJ222	2.2k	
R4	ERJ3GEYJ102	1k	
R5	ERJ3GEYJ104	100k	
R6	ERJ3GEYJ104	100k	
R7	ERJ3GEYJ222	2.2k	
R8	ERJ3GEYJ153	15k	
R9	ERJ3GEYJ103	10k	
R10	ERJ3GEYJ103	10k	
R11	ERJ3GEYJ223	22k	
R12	ERJ3GEYJ473	47k	
R13	ERJ3GEYJ563	56k	
R14	ERJ3GEYJ473	47k	
R15	ERJ3GEYJ123	12k	
R16	ERJ3GEYJ334	330k	
R17	ERJ3GEYJ123	12k	
R18	ERJ3GEYJ103	10k	
R19	ERJ3GEYJ223	22k	
R20	ERJ3GEYJ102	1k	
R21	ERJ3GEYJ223	22k	
R22	ERJ3GEYJ222	2.2k	
R23	ERJ3GEYJ223	22k	
R24	ERJ3GEYJ562	5.6k	
R25	ERJ3GEYJ153	15k	
R26	ERJ3GEYJ563	56k	
R27	ERJ3GEYJ222	2.2k	
R28	ERJ3GEYJ333	33k	
R29	ERJ3GEYJ151	150k	
R30	ERJ3GEYJ103	10k	
R31	ERJ3GEYJ563	56k	
R32	ERJ3GEYJ563	56k	
R33	ERJ3GEYJ123	12k	
R34	ERJ3GEYJ105	1M	
R35	ERJ3GEYJ563	56k	

Ref. No.	Part No.	Part Name & Description	Remarks
R36	ERJ3GEYJ224	220k	
R37	ERJ3GEYJ563	56k	
R38	ERJ3GEYJ332	3.3k	
R39	ERJ3GEYJ223	22k	
R40	ERJ3GEYJ333	33k	
R41	ERJ3GEYJ223	22k	
R42	ERJ3GEYJ473	47k	
R43	ERJ3GEYJ473	47k	
R44	ERJ3GEYJ563	56k	
R45	ERJ3GEYJ105	1M	
R46	ERJ3GEYJ153	15k	
R47	ERJ3GEYJ103	10k	
R48	ERJ3GEYJ473	47k	
R49	ERJ3GEY0R00	0k	
R50	ERJ3GEYJ105	1M	
R51	ERJ3GEYJ104	100k	
R52	ERJ3GEYJ104	100k	
R54	ERJ3GEYJ103	10k	
R55	ERJ3GEYJ820	82k	
R56	ERJ3GEYJ820	82k	
R57	ERJ3GEYJ104	100k	
R58	ERJ3GEYJ104	100k	
R60	ERJ3GEYJ104	100k	
R62	ERJ3GEYJ104	100k	
R63	ERJ3GEYJ104	100k	
R64	ERJ3GEYJ331	330k	
R65	ERJ3GEYJ101	100k	

26.1.4. TOOL

Ref. No.	Part No.	Part Name & Description	Remarks
ZZ1	PQZZ20K4Z	EXTENTION CORD	

27. CIRCUIT BOARD (RF P.C. Board)

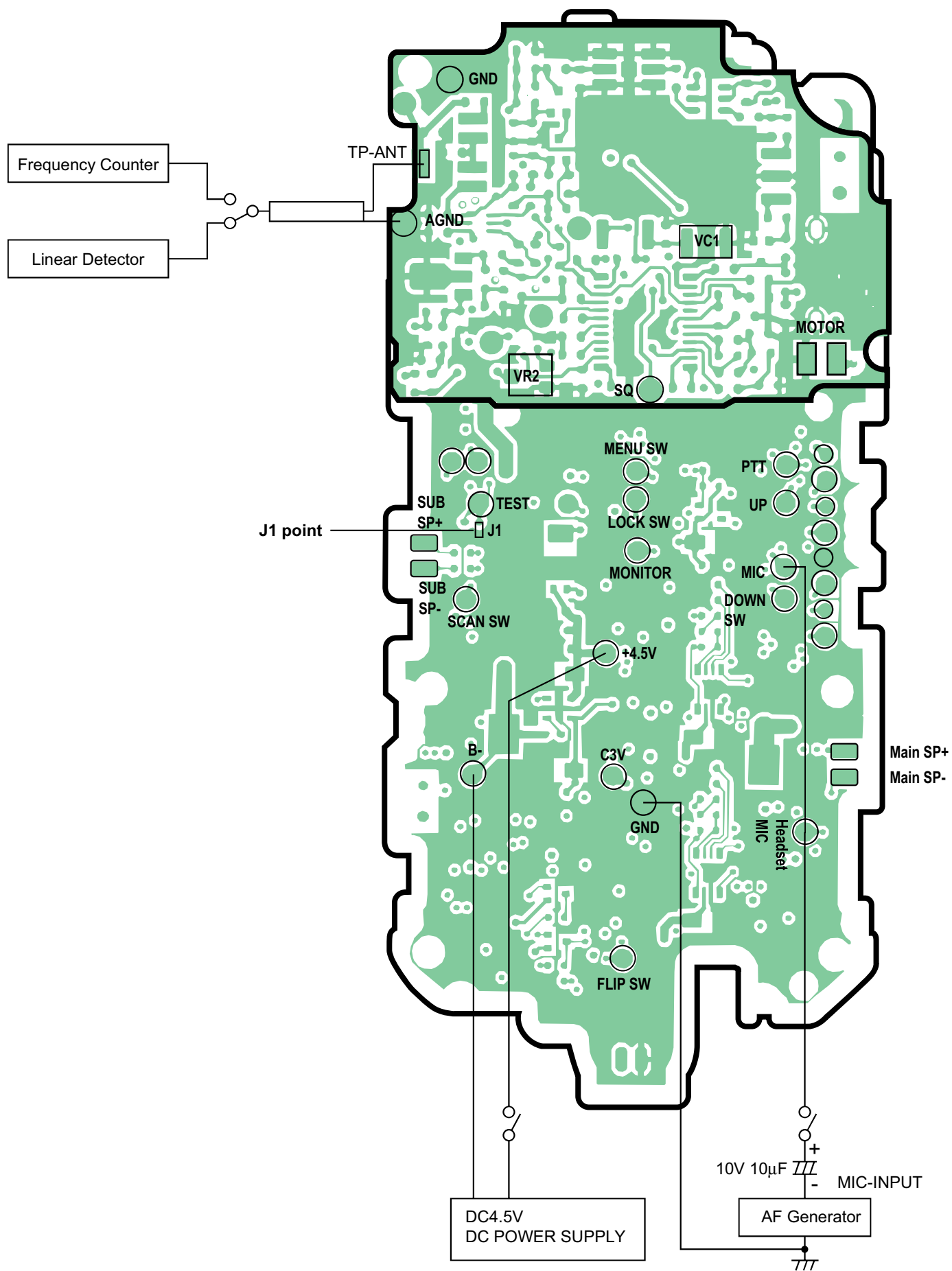
28. SCHEMATIC DIAGRAM

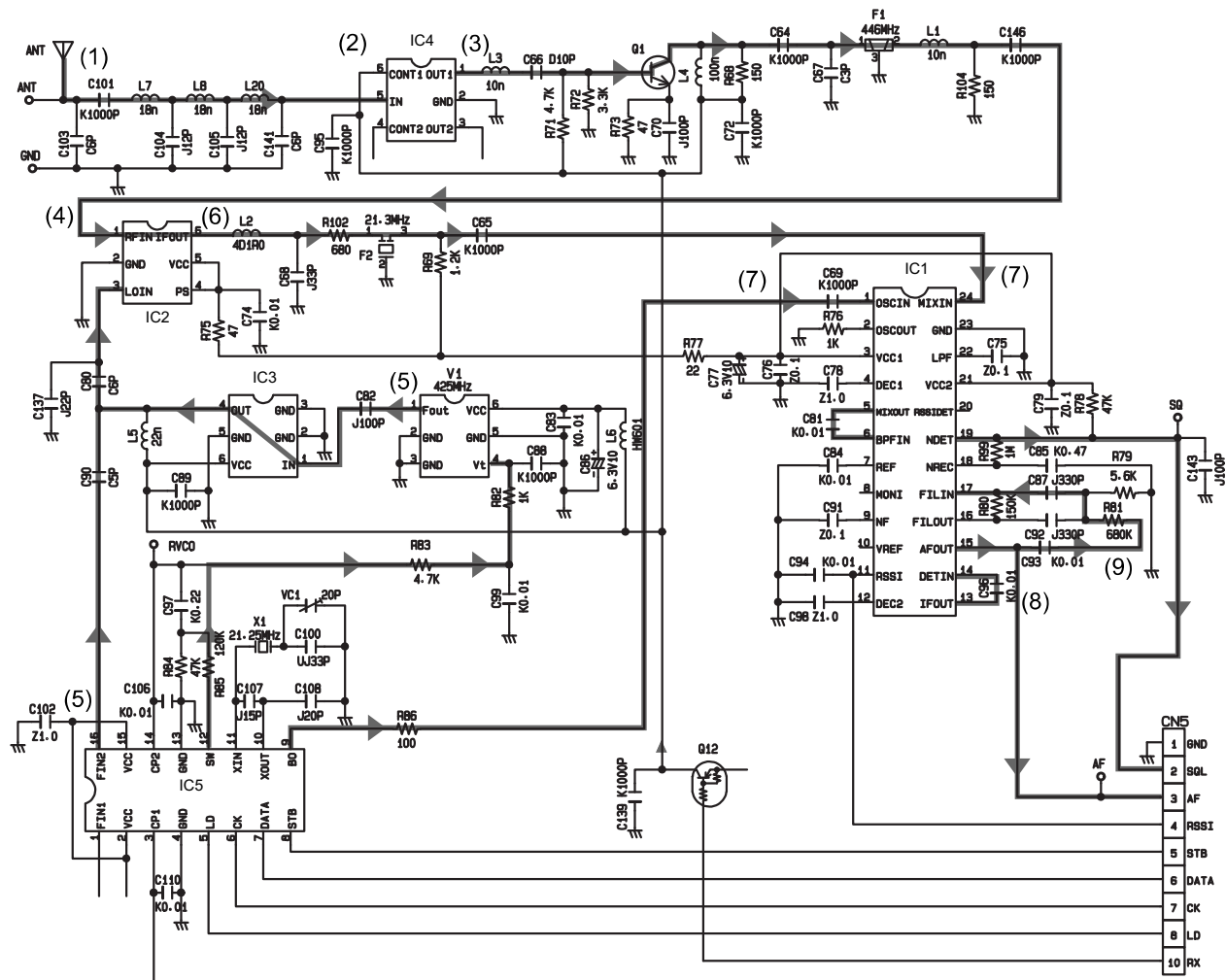
28.1. RF P.C. Board

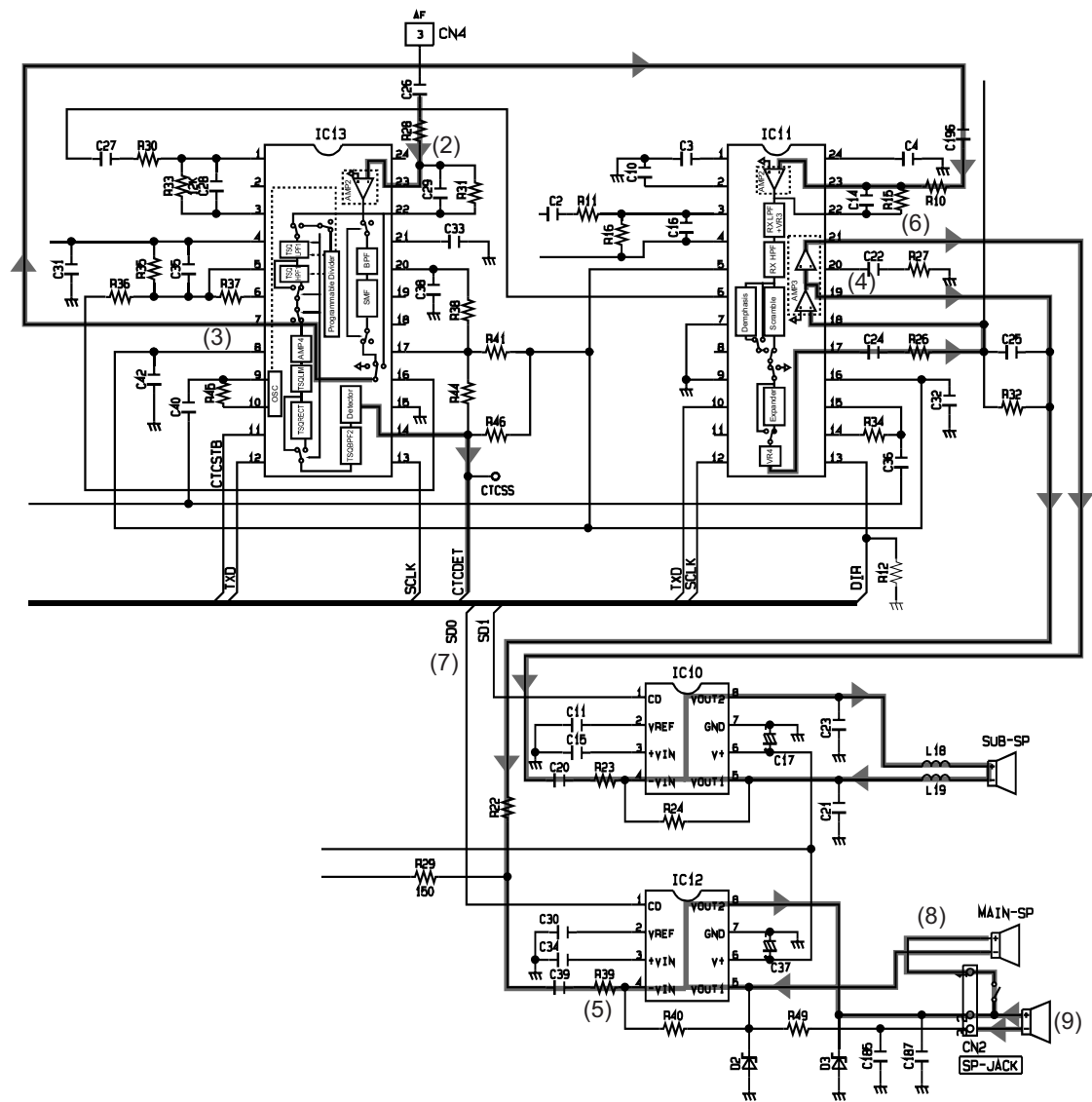
28.2. CPU P.C. Board

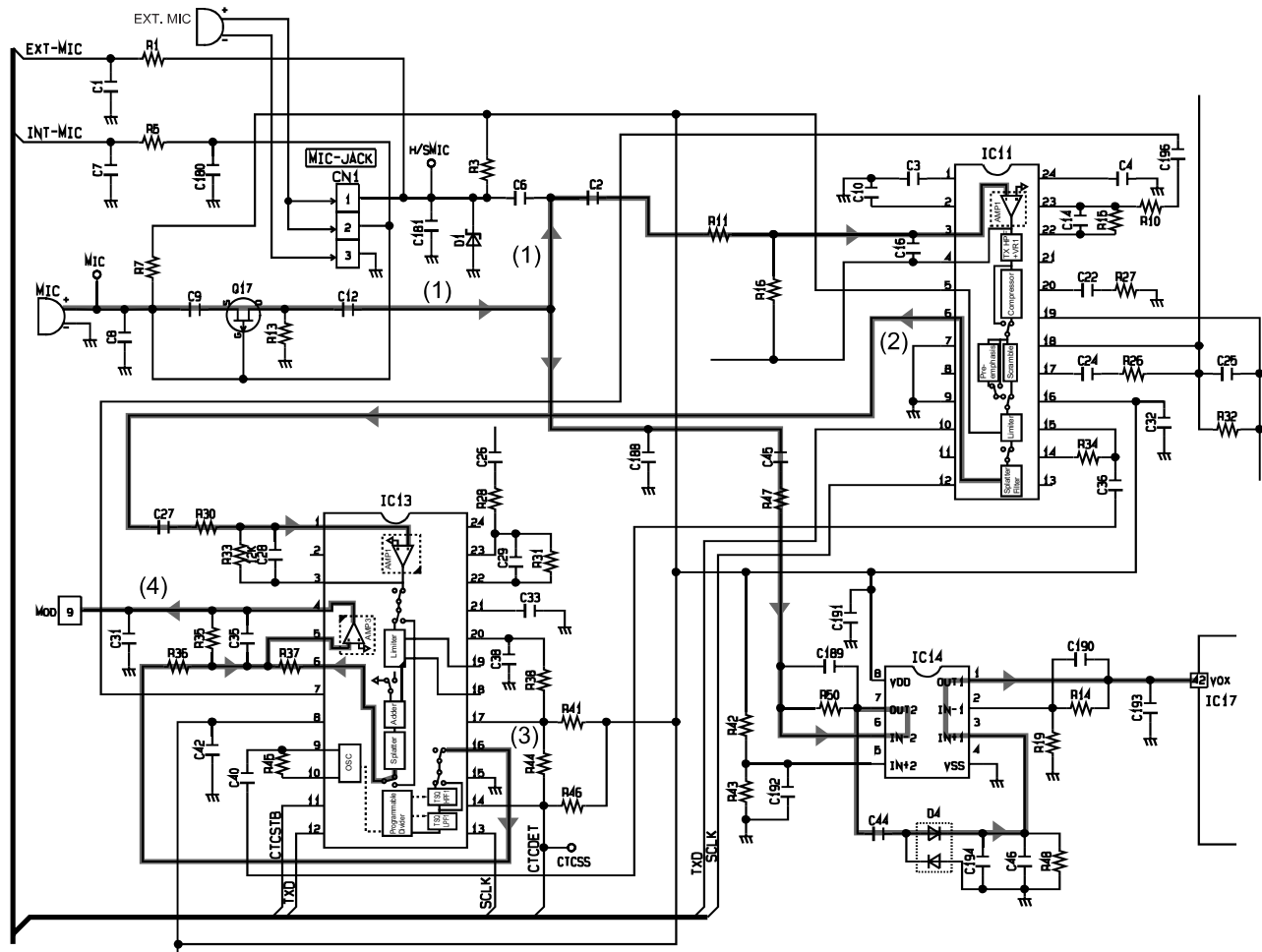
29. CIRCUIT BOARD (CPU P.C. Board)

U (W) / KXTR320EXF / KXTR320EXS / Printed in Japan

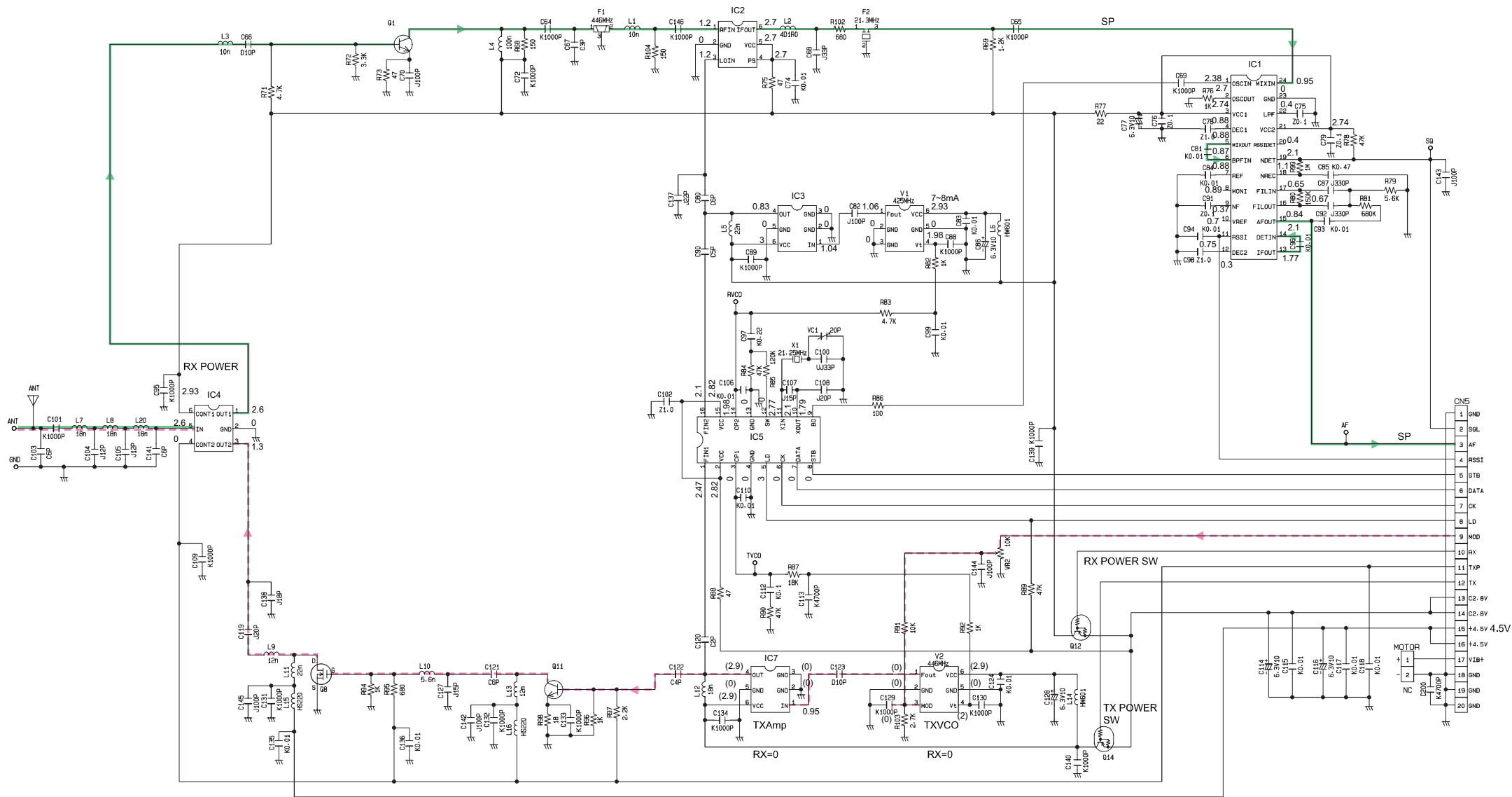


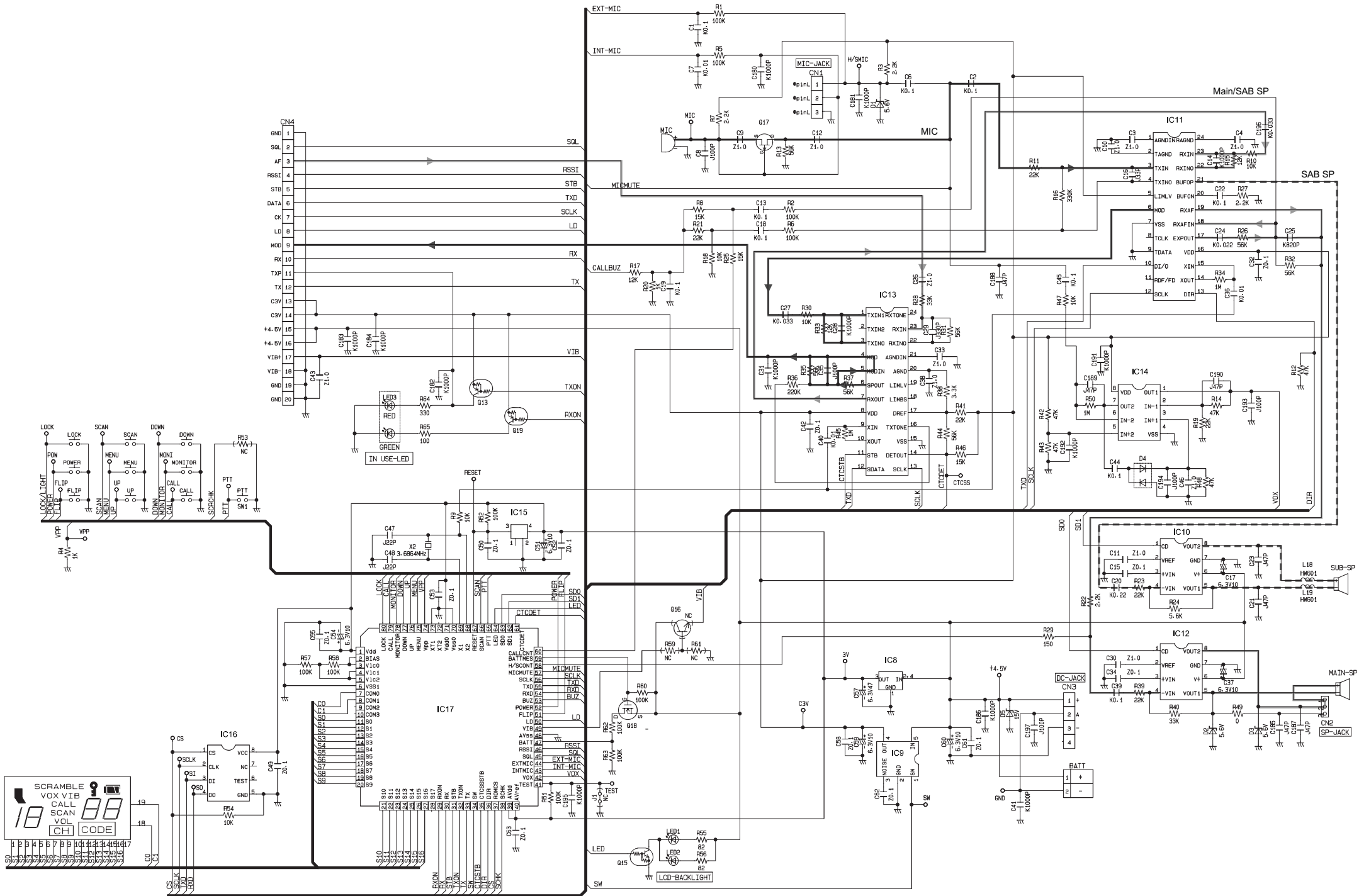




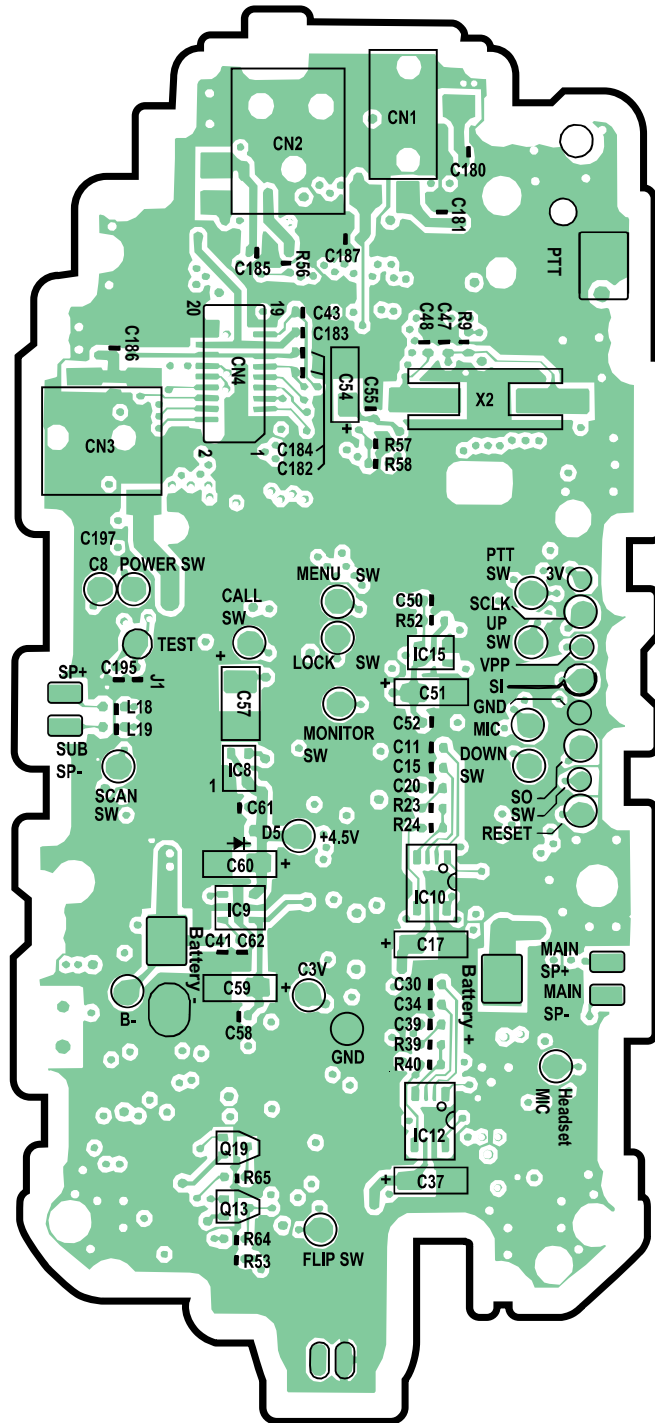


[illegible]





(Component View)



(Flow Solder Side View)

